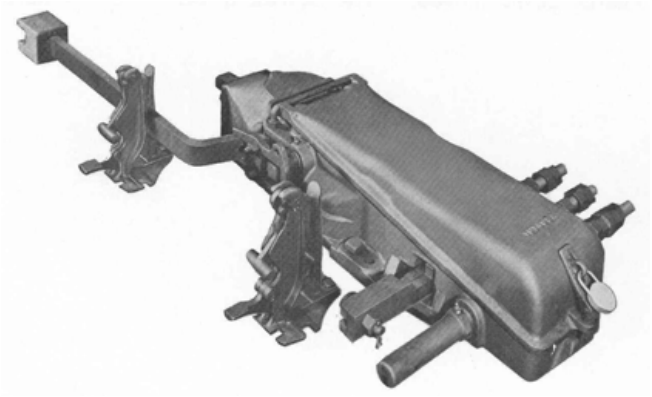
T-20, T-21

HAND-OPERATED SWITCH MACHINES

(SWITCH STANDS)



- **Installation**
- **Operation**
- **Maintenance**

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Revision History

REV.	DATE	NATURE OF REVISION
0	May, 1990	Initial Issue
1	October, 2009	Incorporated ECO 139712-346;added note to Section 4.1. Incorporated ECO 140250-17; added switch stand part numbers to Section 5.1. Added new diagram for Figure 5-1.

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1. GENERAL INFORMATION

1.1. Introduction

These instructions cover the installation, adjustment and maintenance of the Style T-20 Switch Machine (Switch Stand) (Figure 1-1 and Figure 1-2). They also apply to the Style T-21 Switch Machine (Switch Stand) (Figure 1-3).

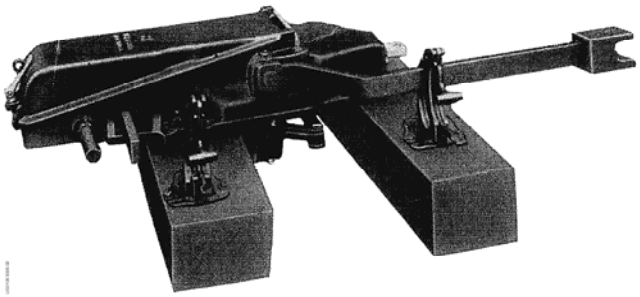


Figure 1-1. T-20 Switch Stand

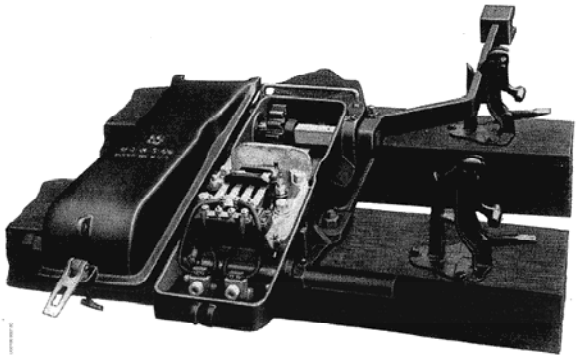


Figure 1-2. T-20 Switch Stand With Cover Removed

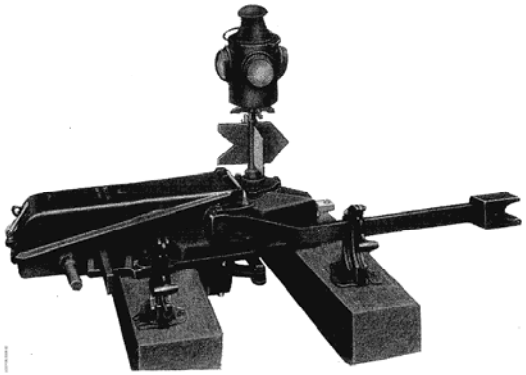


Figure 1-3. T-21 Switch Stand

The Style T-20 has no target features. A similar switch machine with a target staff and the necessary driving device is designated as the Style T-21. The Style T-20 may be converted into a Style T-2 1 by machining an opening in the base casting for receiving the target staff bearing, drilling for three mounting bolts, replacing the T-20 rack with a T-21 rack, and by adding the target staff assembly. However, if a target may be added in the future, it is recommended that a T-2 1 Switch Stand be ordered without the target staff and bearing. The opening for the target staff bearing is then closed with a blanking plate.

1.2. General Description

The Style T-20 Switch Stand is of the rack and escapement crank type and is equipped with a circuit controller arranged for the application of a point detector device.

This switch stand provides a lock bar which, with the switch in the normal position, enters a notch in the lock rod, thereby locking the switch points in their normal position to afford facing point lock protection. In addition, the escapement crank mechanism is such that the driving system itself locks the switch in either extreme position.

The T-20 ordinarily is equipped with a standard circuit controller which has four pairs of independent contacts that are shifted in unison and check that both the mechanism (including lock bar) and the switch points (by the point detector) are in the Normal position. This circuit controller may also be fitted with a reverse point detector feature consisting of additional contacts located on a separate terminal board which check the switch points in the Reverse position.

NOTE

ASTS USA no longer manufactures the heavy duty circuit controller. The heavy duty circuit controller descriptions below and throughout this manual are only applicable to existing switch machines and should be used for reference only.

For heavy-duty shunting the switch stand is fitted with a heavy duty, instead of standard, circuit controller. Reverse point detection is not available with this type of controller.

The heavy-duty circuit controller for the Styles T-20 and T-21 hand-operated switch mechanisms is interchangeable with and is used in place of the standard circuit controller for shunting track circuits in electrified territory and other heavy-duty shunting. The contacts are of the knife-blade type and are normally open. Four fixed jaws with external lug terminals are engaged in pairs by two inverted U-shaped knife-blades when either the lock bar or the point detector bar (or both) is not in its Normal position. If the contacts are closed by displacement of the point detector bar while the lock bar remains in the notch in the lock rod (as when a switch is improperly trailed), the contacts will remain closed thereafter, even if the point detector bar returns to its Normal position. This action is equivalent to the point detector latch operation in the standard circuit controller, and the controller may be similarly reset, provided that the point detector bar and the lock rod are in proper alignment, by hand operating the switch to the Reverse position and back

again to the Normal position. However, if the latching device has been tripped because of an improper trailing move through the switch, the switch and the hand-operating mechanism should be carefully examined for possible damage before resetting the circuit controller.

Both the heavy-duty and the standard circuit controllers have a point detector latch feature which will hold the normal contacts in their reversed positions after they are shifted by traffic improperly "running through" the switch locked in the normal position, even though the point detector bar may return to or beyond its normal position.

The movement is protected from dust, rain and snow, and the droppings from passing trains by a single cover which extends over both the switch operating mechanism and the circuit controller and is sealed with packing. This cover is removed and is attached to the housing by a "screw-down" hasp at one end and by an adjustable hinge at the other end.

1.3. Applications

The T-20 switch stand readily accommodates the many variations of switch layouts, single switch or crossovers, with provisions for independent locking and derail operation. Operation of a derail by connection to the projecting end of the lock bar is shown in Figure 1-4. Two arrangements for interlocking the switch mechanisms at the ends of a crossover are shown in Figure 1-5 and Figure 1-6.

The application in Figure 1-4 shows a single switch using the X assembly as illustrated in Figure 1-7. The switch is operated and locked for facing point protection and has a provision for operating a pipe connected derail. A derail can be connected to the projecting end of lock bar P by a pipe.

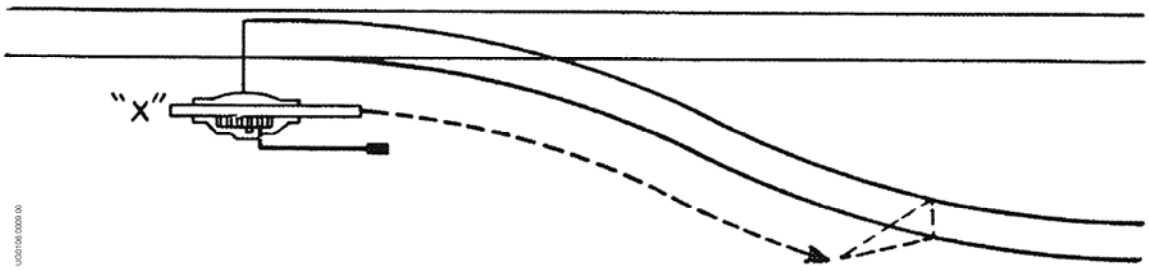


Figure 1-4. Single Switch Application

The application in Figure 1-5 shows crossover switches that provide complete facing point protection. Operation of the X stand (Figure 1-7) unlocks and throws the right hand end of the crossover. And through a pipe connection, unlocks the points at the other end. Operation of the Y stand (Figure 1-8) reverses the points at the left hand crossover. To restore the crossover points to normal, the reverse sequence of operation is necessary.

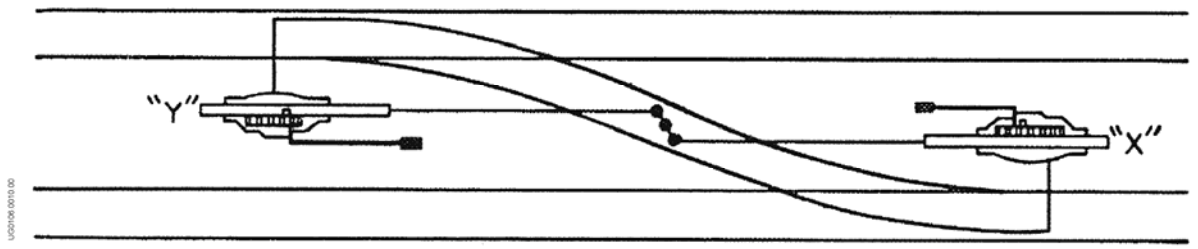


Figure 1-5. Crossover Switches

The application in Figure 1-6 shows crossover switches that use the Y stand (Figure 1-8). The stands have independent locking bars and are operated from a hand throw lever at Z.

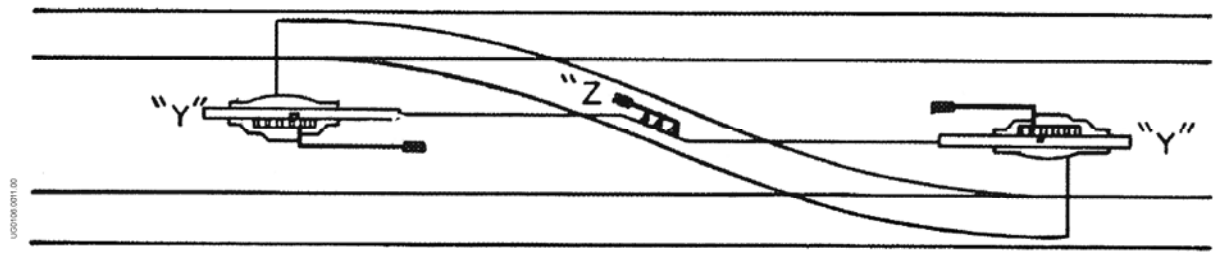


Figure 1-6. Crossover Switches With Hand Lever Operation

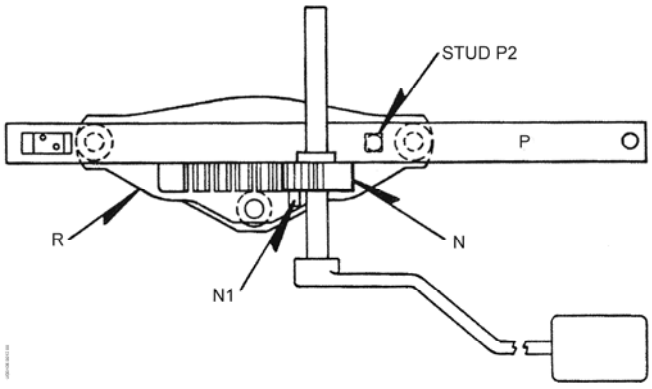


Figure 1-7. X Assembly

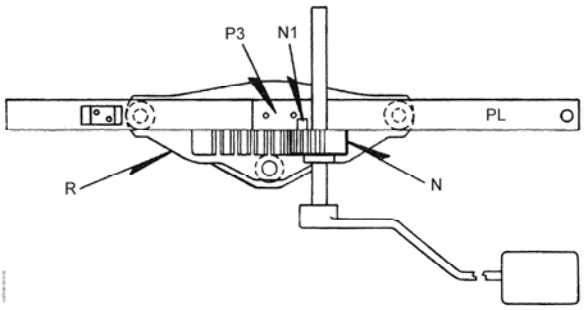


Figure 1-8. Y Assembly

Typical application to a single switch is illustrated in Figure 1-9. Standard switch fittings are used throughout and the layout is reversible for either right or left hand except where circumstances such as tie spacing, point drilling, etc. require both horizontal set and vertical set in the rods. The switch stand, however, can always be assembled for either right hand or left hand application, and in either application the switch point adjacent the stand may be normally open or normally closed.

For the usual application to a single switch, with or without derail connection (Figure 1-4 or Figure 1-9), the lock bar P is fitted with a stud P2 which engages with rack R so that it and the lock bar move as one member when the hand lever is thrown (Figure 1-7).

For applications where switch stands at the ends of a cross-over are interlocked (Figure 1-5 and Figure 1-6), the dependent stands designated " Y" have a lock bar assembly per Figure 1-8 in which the lock bar PL is operated independently of rack R. For this arrangement the pinion gear N is reversed from its position in Figure 1-7 so that lug N1 engages with dog P3, riveted on top of lock bar PL, to prevent operation of the stand until the bar has been moved to unlock the switch points. The lock bar PL in Figure 1-8 is longer than that used in Figure 1-7 to enforce a longer unlocking stroke (Figure 1-10).

The direct-drive and independent-drive arrangements of lock bar described in the preceding paragraphs for mechanisms with the standard circuit controller are available also when the heavy-duty controller is used. The bars used with the heavy-duty controller, however, are not the same bars as those used with the standard circuit controller.

Where it is desirable that the unlock of the switch be controlled by an operator in a nearby tower or by track circuits, an electric switch lock such as the ASTS USA SL-21A can be used in place of the standard lever latch stand.

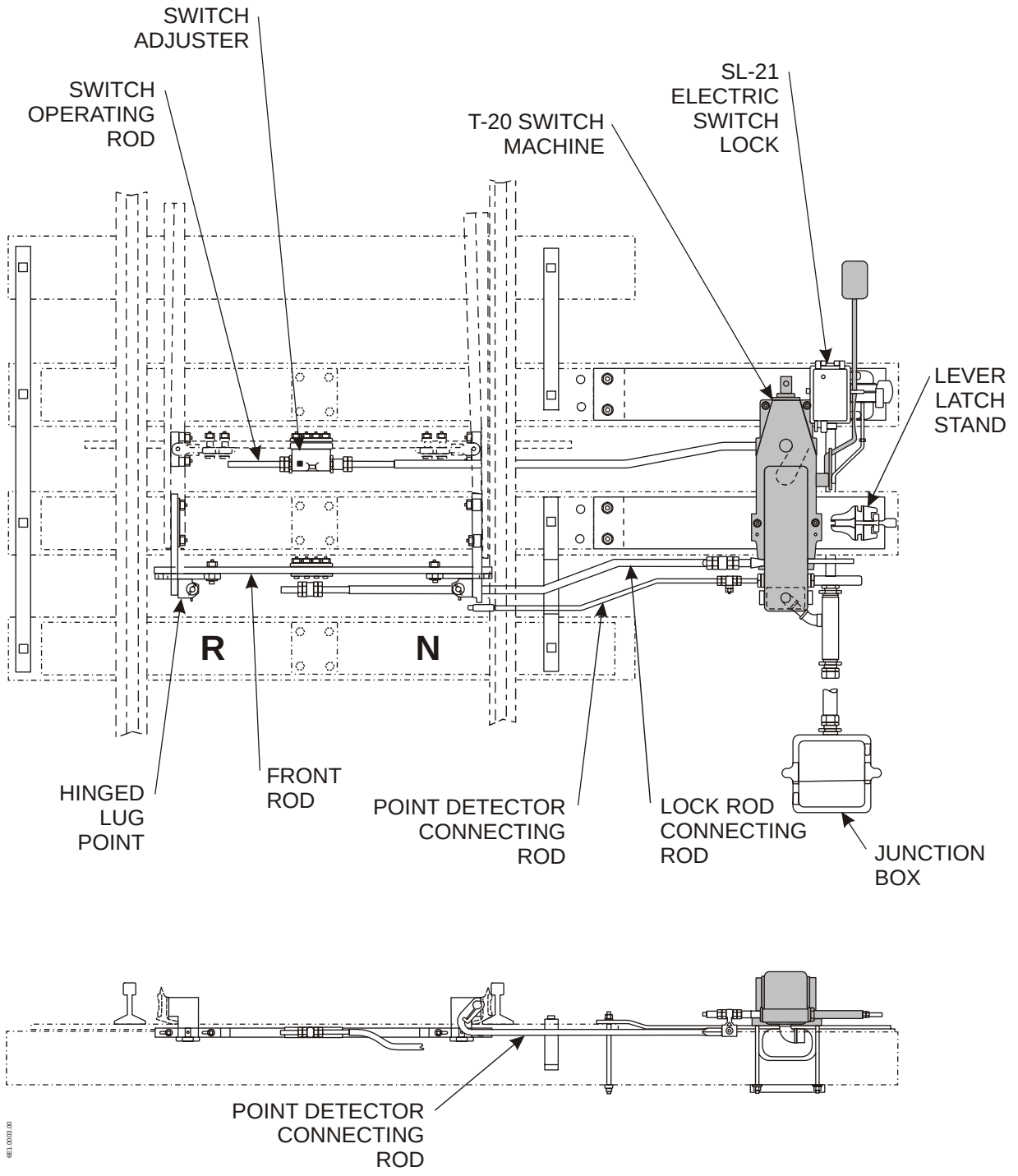


Figure 1-9. Right Hand Layout for the Style T-20 or T-21 Switch Stand

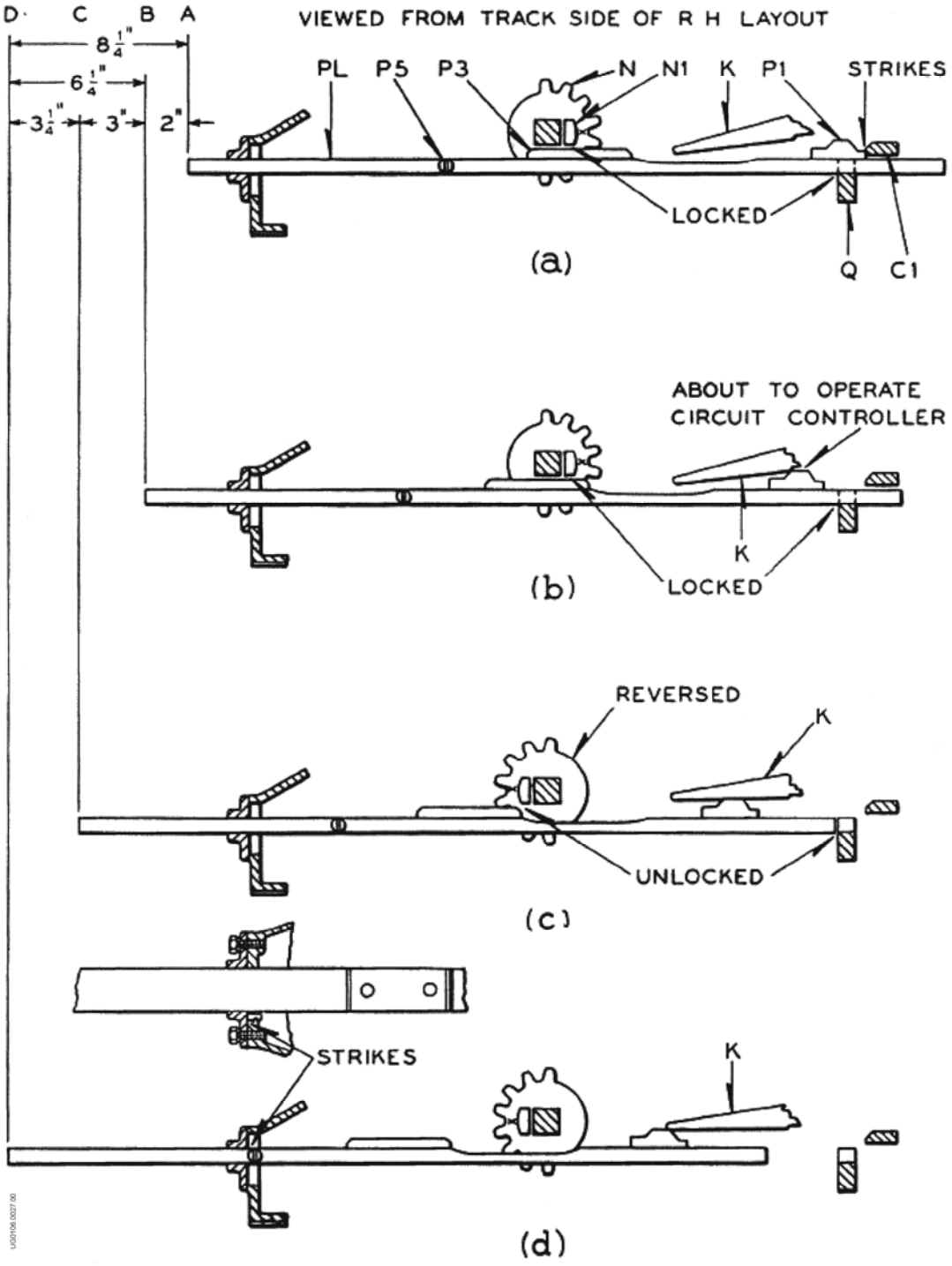


Figure 1-10. Operating Characteristics

2. OPERATION

2.1. Switch Operating Mechanism

The switch operating mechanism as shown in Figure 2-1 consists of a heavy segmental gear N mounted on a square shaft M2, which is directly connected to the hand-throw lever M and is mounted in journals in the housing A. When the hand-throw lever is operated, the gear imparts a longitudinal motion to the rack R.

On the underside of the rack (Figure 2-2) are three heat-treated rollers, Rl, R2, and R3. Rollers R2 and R3 are on the centerline of the movement and serve to guide the rack in its longitudinal motion. Roller R 1, which is off the centerline and midway between rollers R2 and R3, works in conjunction with the escapement crank E to produce rotation of the switch operating crank G. The nominal stroke of the rack, seven inches, imparts a sixty degree rotation to the escapement crank and the switch operating crank. The working surfaces of both the escapement crank E and the engaging roller Rl are heat-treated and hardened. The switch operating crank G is assembled on the two-inch square section of the escapement crank E, between the upper and lower bearings. These two bearings take directly the operating rod loads, and thus promote long life.

The locking of the switch operating rod is effected by having the engaging roller Rl "over-travel" the escapement crank at each end of the stroke.

2.2. Circuit Controller

2.2.1. Standard Type

The standard circuit controller for the T-20 switch stand, Figure 2-3 provides normal indication through four pairs of contacts Sl-S2 selectively operated by either the dog Pl on the lock bar P or the point detector bar V. When the hand-throw lever is operated from the normal position, the dog Pl, located near the locking end of the lock bar, rotates the rocker arm K counterclockwise. The left end of the rocker arm then forces the contact operating bracket Dl, downward in opposition to the phosphor bronze coil springs which maintain the normal position of the contacts. The first 5/8" to 3/4" motion of the lock bar completes the circuit controller operation before the lock bar P is completely withdrawn from the lock rod Q.

Point detector operation consists of transferring motion from the point detector bar V to the rocker arm K in one direction only, so that selective operation of the contacts is obtained as stated. When the point detector bar V is displaced from its normal position by movement of the switch points, the lever F, which carries the roller F3, turns clockwise. This motion, in turn, rotates the rocker arm K counterclockwise by reason of the engagement of the head of finger Fl with the conical headed screw K2 on the rocker arm. Rotation of the rocker arm counterclockwise causes the contacts to function as in normal operation.

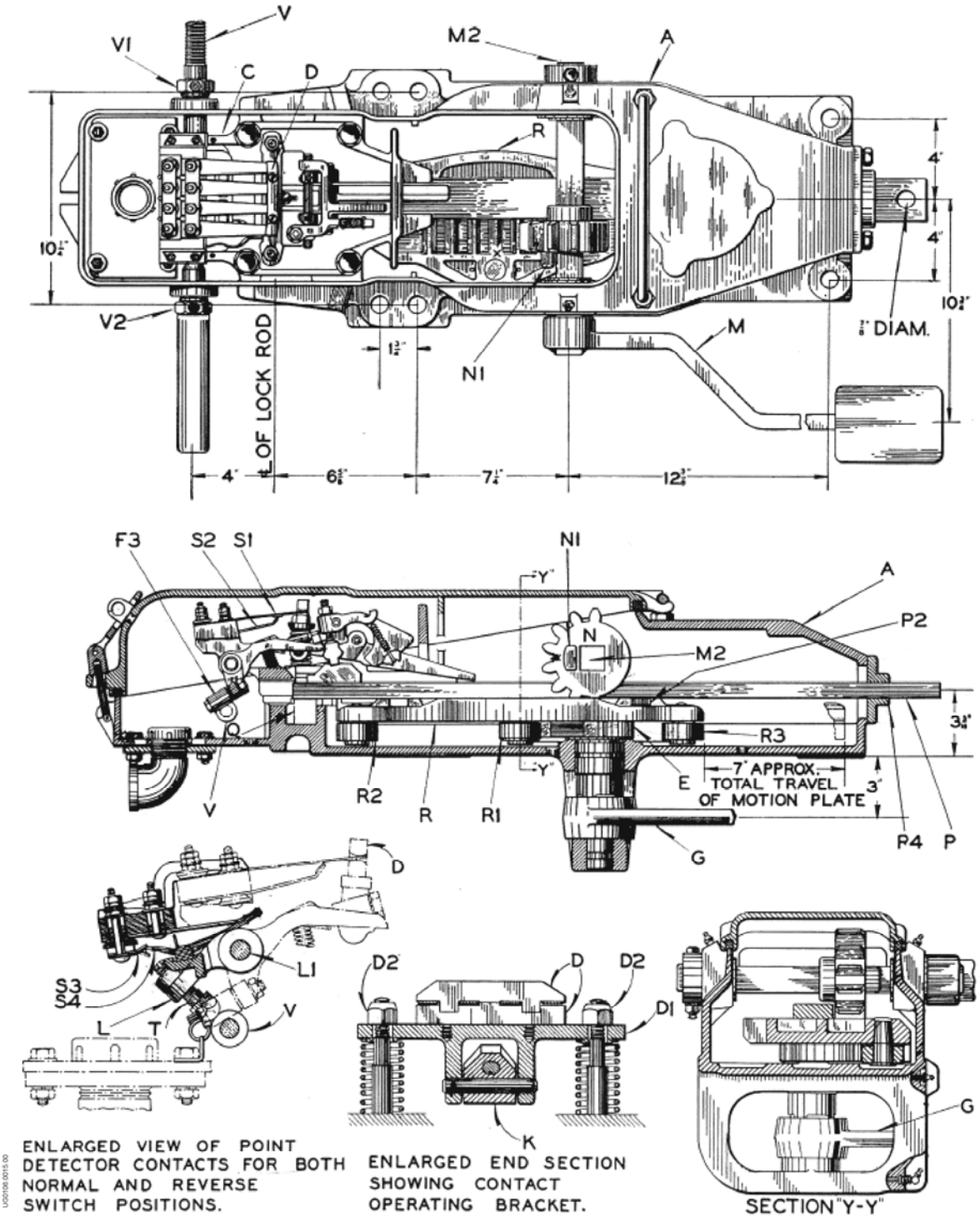
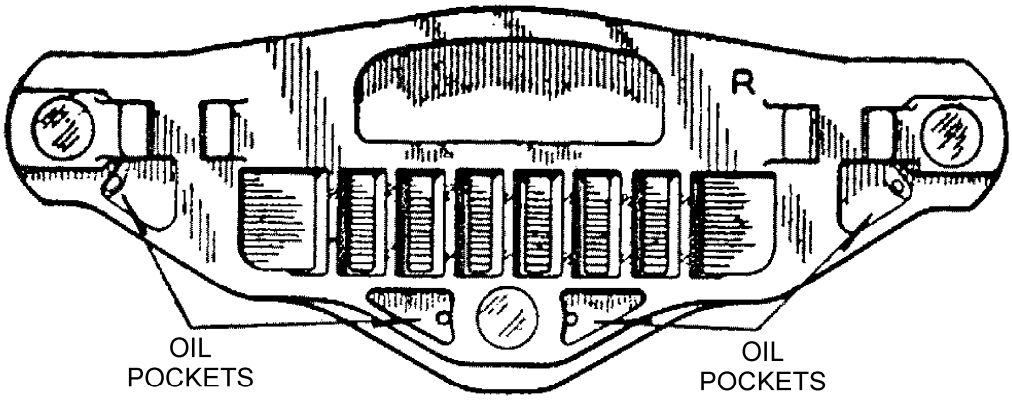
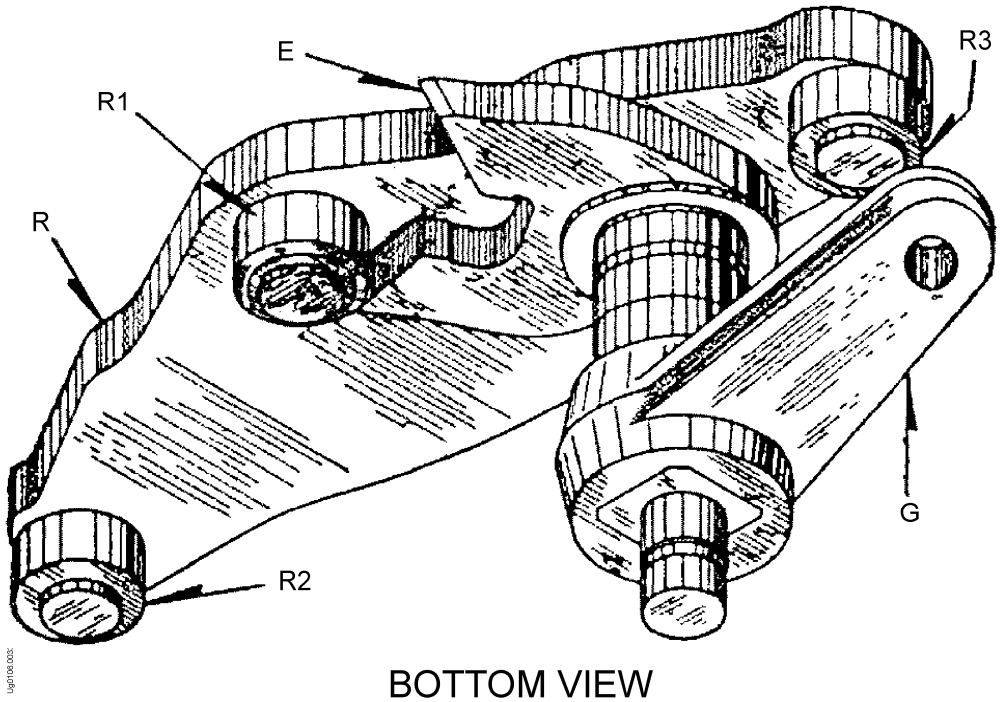


Figure 2-1. Assembly Views of Style T-20 Switch Stand



TOP VIEW



BOTTOM VIEW

Figure 2-2. Top And Bottom Views of Rack, Escapement, And Switch Operating Crank.

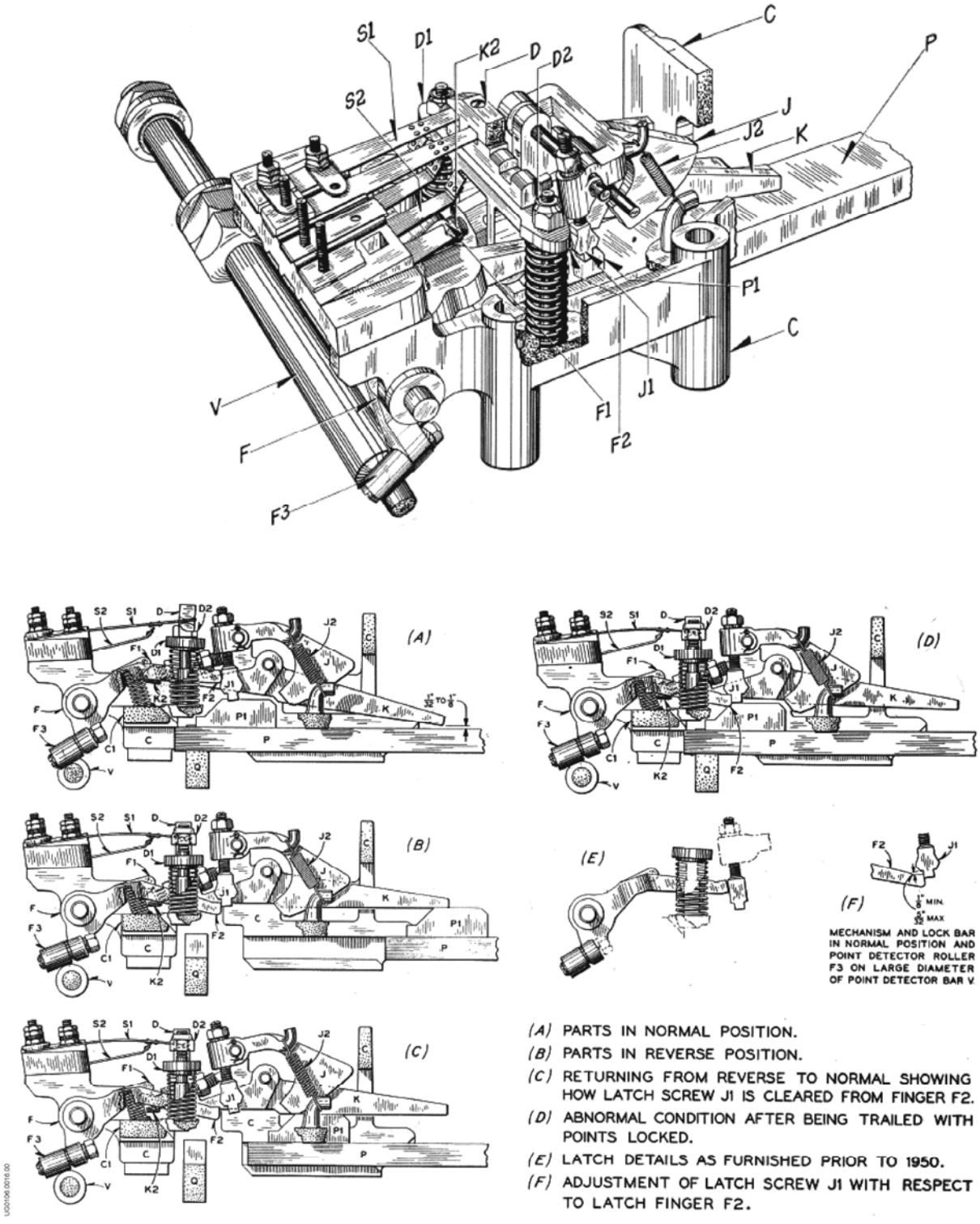


Figure 2-3. Sectional Views of Standard Circuit Controller

The point detector latch consists of a pivoted arm J which carries the adjustable latch screw Jl. The face of the latch screw normally rests against the end of the latching finger F2 on the point detector lever F. When the switch is improperly "run through" while in the normal position, the contacts are operated by motion of the point detector bar while the lock bar is still in the lock rod notch. The end F2 of the finger is depressed, and the face of latch screw Jl takes a position above the end of the finger since the latch arm is urged clockwise by its weight and the spring J2. Thus, the circuit controller as shown in View (D) of Figure 2-3 is prevented from returning to normal until released manually by throwing the hand-throw lever to reverse, or by lifting the latch arm J.

In 1950 latch screw Jl was changed to have a sloped surface, the end of latch finger F2 was rounded, and the contact operating bracket springs were stiffened.

These changes reduce the possibility of undesired operation of the latch resulting from momentum overtravel of the parts when excess traffic vibration causes the point detector bar to "hammer blow" on the roller. The latch finger, working on the sloped face of the latch screw, kicks the latch screw away from the latch finger momentarily, thus allowing the latch finger to return again to its normal position without interference from the latch screw.

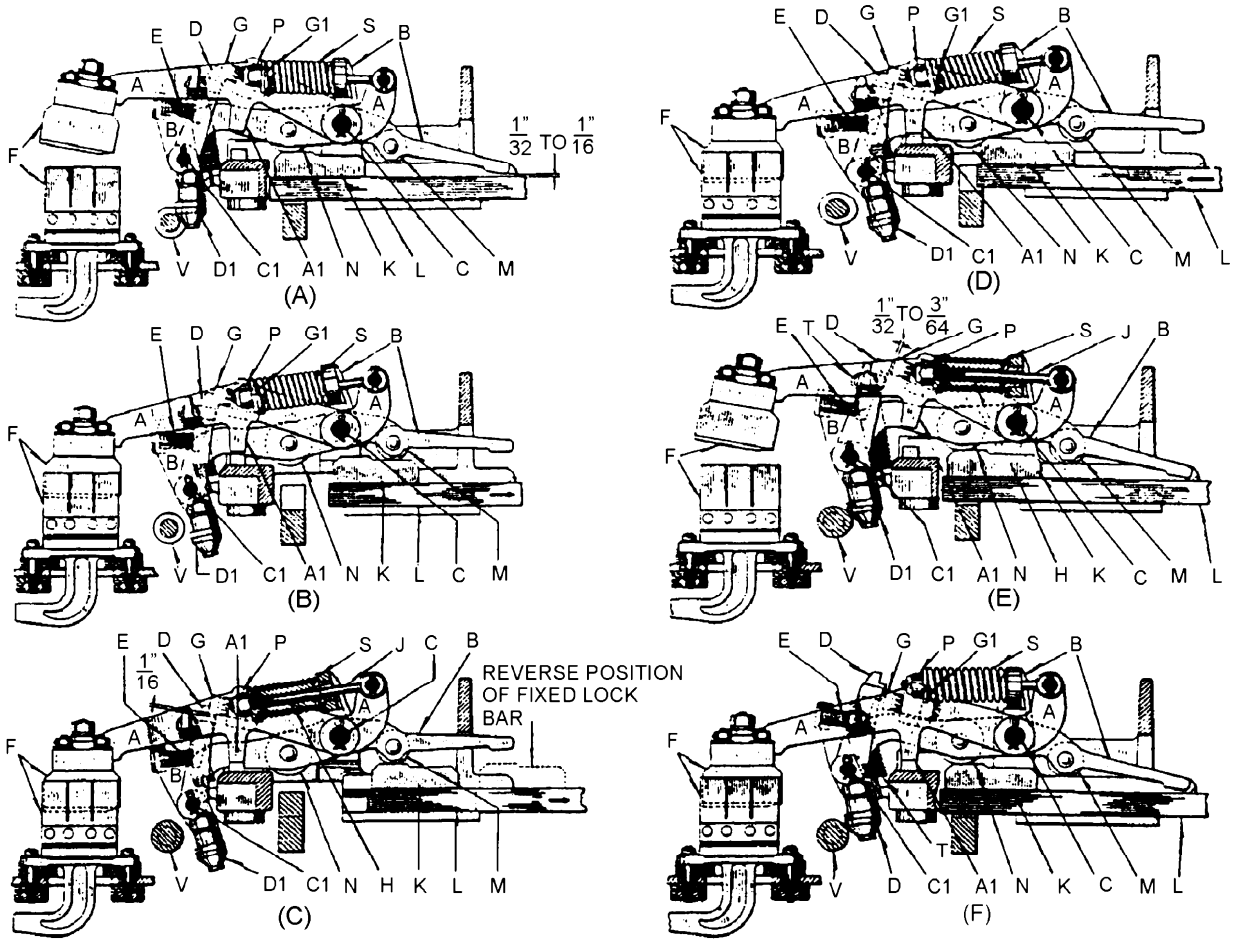
NOTE:

When the T-20 mechanism is used at a SPRING SWITCH (no lock rod), the latch must be rendered ineffective by removing latch arm J.

The reverse point detector feature (when used) provides indication for reverse position of the switch points through four pairs of contacts S3-S4, Figure 2-1, operated by the point detector bar V. The bracket lever L which shifts these contacts is pivoted at L1 and is rotated clockwise by engagement of stud T with the large diameter of the point detector bar to hold the reverse point detector contacts up except when the switch is in the reverse position.

2.2.2. Heavy Duty Type (for reference only)

The operation of the heavy-duty circuit controller is illustrated in Figure 2-4. Figure 2-4 (a), (b), and (c) show the successive steps during ordinary hand operation, Figure 2-4(d) illustrates the action when the switch is hand-operated back to the Normal position, and Figure 2-4(e) and Figure 2-4(f) show the action of the latching device.



(A) PARTS IN NORMAL POSITION.

(B) POSITION OF PARTS DURING FIRST PART OF LOCK BAR STROKE.

(C) POSITION OF PARTS DURING LAST PART OF LOCK BAR STROKE.

(D) LOCK BAR RETURNING TO NORMAL POSITION.

(E) LATCH TRIPPED BY DISPLACING POINT DETECTOR BAR WITHOUT WITHDRAWING LOCK BAR (PARTS SHOWN IN A SUSPENDED POSITION AT INSTANT BEFORE CONTACT ARM MOVES).

(F) FINAL POSITION OF PARTS AFTER LATCH IS TRIPPED.

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Figure 2-4. Sectional Views of Heavy Duty Circuit Controller (for reference only)

Contact arm A, Figure 2-4(a), and latch bracket B both pivot on the fixed pin C and are urged to rotate in opposite directions by compression springs S. They are ordinarily restrained from relative motion by latch D which pivots on latch bracket B at C1 and is urged into latching position by small springs E. Under certain conditions, however, the latch is tripped out of place by point detector operation.

When the movement is hand-operated to the Reverse position, the lock bar L moves to the right (i.e., out of the lock rod). The lower step on lock bar dog K engages and lifts roller M, thus rotating latch bracket B counterclockwise and closing knife-blade contacts F before the lock bar has cleared the lock rod, -see Figure 2-4(b). As the lock bar continues its stroke, the top step of lock bar dog K engages roller M to complete the stroke of latch bracket B and fully closes the contacts F, - Figure 2-4(c); contact arm A is stopped by its lugs A1 engaging lugs on the frame, thus restricting the rotation of the contact arm to a somewhat less than the rotation of the latch bracket B. This difference in rotation pulls the step of latch D away from the underside of latch adjusting screw G a distance of approximately 1/16". In this position, Figure 2-4(c), the spring sockets H just touch the latch bracket B (by adjustment of the nuts on spring eyebolts J); therefore, the contacts F would be operated to the position shown, by lock bar withdrawal, even though springs S were broken.

When the switch is hand-operated back towards the Normal position, the lock bar L moves to the left (i.e., towards the lock rod). Roller N, Figure 2-4(d), is engaged by the lock bar dog K, thus lifting latch bracket B until latch D engages screw G on contact arm A. Further movement of the lock bar from this position (in which lock bar has already entered the notch in the lock rod) restores the circuit controller to the Normal position as shown in Figure 2-4(a).

If the point detector bar is displaced while the lock bar remains in the lock rod (as would occur if the switch is improperly trailed), the large diameter of point detector bar V will engage roller D1 on latch D and thus trip the latch out of engagement with screw G, Figure 2-4(e), and contacts F will be closed by joint action of springs S and T, Figure 2-4(f), and will remain closed even if the point detector bar subsequently returns to its normal position. The controller will be reset by hand operating the switch to Reverse position and back again to Normal position (provided that the lock rod and point detector bar are in proper alignment) because latch D will be moved under screw G by pressure of spring E as the lock bar passes through the position illustrated in Figure 2-4(c).

2.3. Circuits

The circuits controlled may vary in accordance with different railroad standards; however, typical circuits illustrating methods of controlling signals are shown in Figure 2-5 and Figure 2-6.

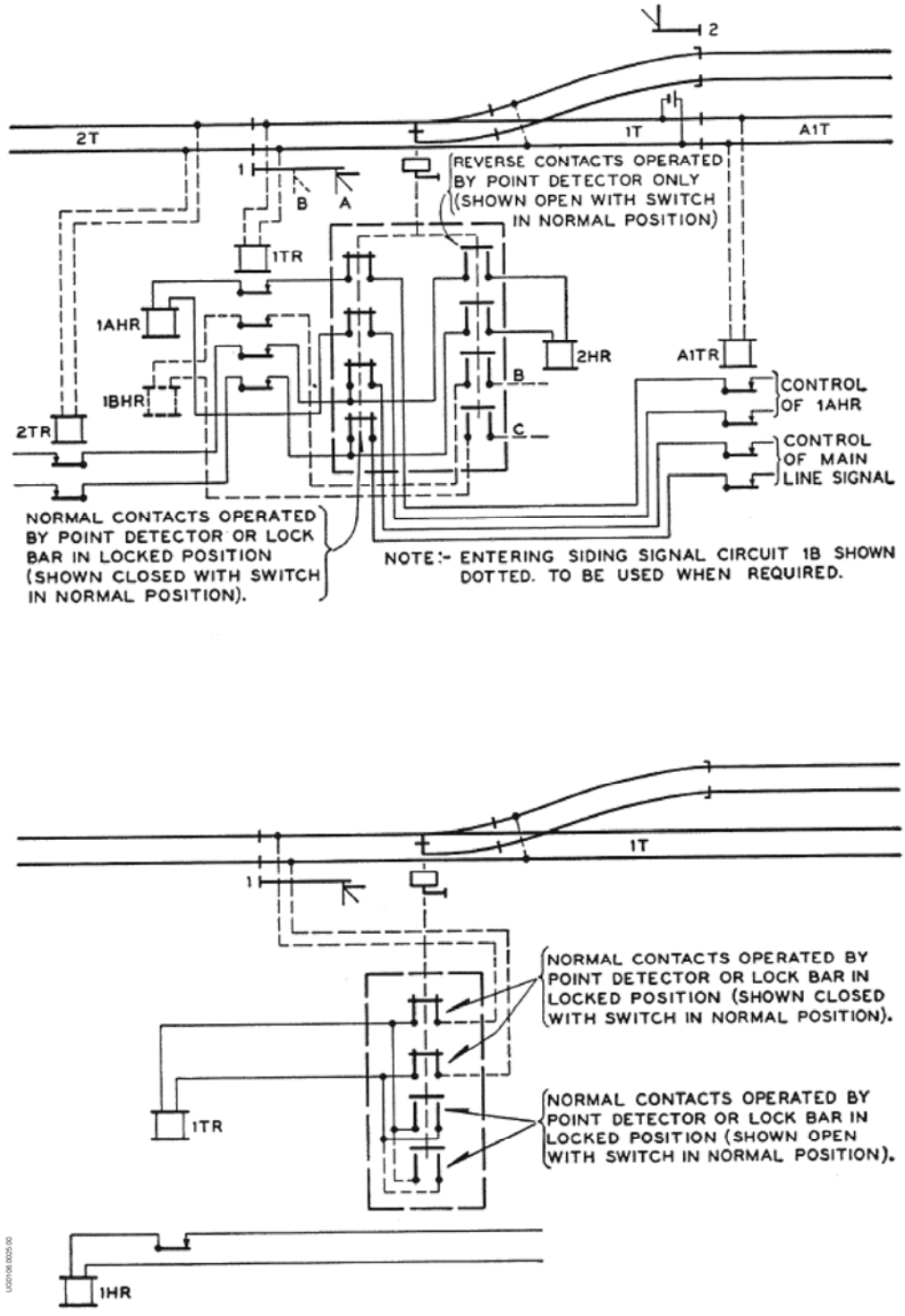

2
2T
1T
A1T
1
B
A
REVERSE CONTACTS OPERATED BY POINT DETECTOR ONLY (SHOWN OPEN WITH SWITCH IN NORMAL POSITION)
1TR
1AHR
2HR
A1TR
B
1BHR
CONTROL OF 1AHR
2TR
C
CONTROL OF MAIN LINE SIGNAL
NORMAL CONTACTS OPERATED BY POINT DETECTOR OR LOCK BAR IN LOCKED POSITION (SHOWN CLOSED WITH SWITCH IN NORMAL POSITION).
NOTE:- ENTERING SIDING SIGNAL CIRCUIT 1B SHOWN DOTTED. TO BE USED WHEN REQUIRED.
1T
1
NORMAL CONTACTS OPERATED BY POINT DETECTOR OR LOCK BAR IN LOCKED POSITION (SHOWN CLOSED WITH SWITCH IN NORMAL POSITION).
NORMAL CONTACTS OPERATED BY POINT DETECTOR OR LOCK BAR IN LOCKED POSITION (SHOWN OPEN WITH SWITCH IN NORMAL POSITION).
1TR
1HR

Figure 2-5. Circuits

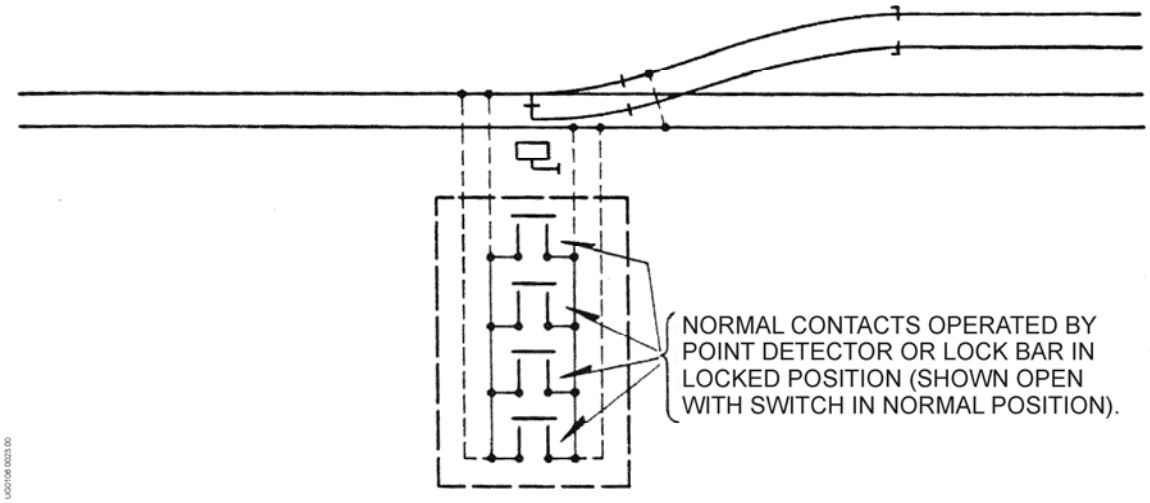


Figure 2-6. Typical Track Shunting Circuit (for reference only)

2.4. T-21 Switch Stand

The T-20 switch stand when equipped with a built-in target drive mechanism is designated as the T-21 Switch Stand.

The target drive mechanism, Figure 2-7(View A), is of simple design and positive in its operation. The lower end of the target shaft B terminates in a toothed portion Wl to which is clamped the serrated hub of crank W. The toothed portion of the shaft is encircled by a groove which receives one-half the diameter of clamping bolt W2. The lower end, or finger, of crank W is restrained in a groove H of the rack R'. Longitudinal motion of the rack causes the crank and target shaft to rotate 90 degrees. The angular relation between the target staff (or lamp tip) and the crank may be changed in 9 degree steps by reassembling the crank on the shaft (see Section 3.2.2).

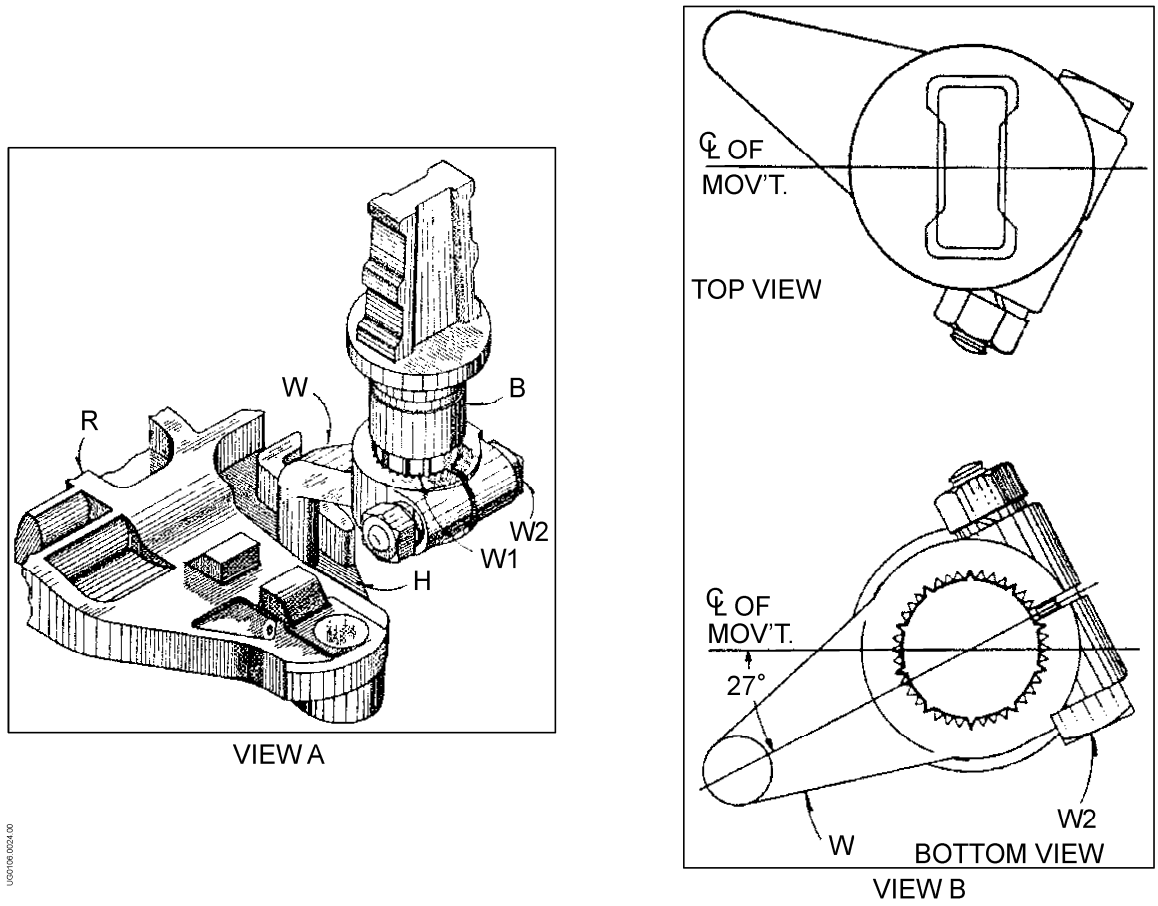


Figure 2-7. Target Drive

3. INSTALLATION AND ADJUSTMENTS

3.1. INSTALLATION

3.1.1. Mounting

The T-20 switch stand is designed for mounting directly on top of the ties. It is recognized that certain switch fittings shown in the layout plan will vary due to standards of different roads. A properly approved layout showing mounting details should be followed when making the installation.

3.1.2. General Instructions

The switch points in their respective closed positions should fit snugly against the stock rails.

The rail braces should be set snugly against the stock rails.

Instructions for installing the Style T-20 or T-21 mechanism when equipped with heavy-duty circuit controller are in general the same as given for the standard type circuit controller.

3.1.3. Interchangeability (R. H. & L. H., etc.)

In general, material for right hand layouts can be applied to left hand layouts (and vice versa) by rearranging the assembly of parts. The switch stand can always be reassembled to suit the various layouts, but in some instances the switch operating rods and lock rod connections (due to having both horizontal set and vertical set) are different for right hand and left hand application.

A switch stand assembled for a right hand layout with the right hand switch point normally closed, Figure 3-1(a), may be reassembled to suit a left hand layout with the left hand switch point normally closed, Figure 3-1(d), by following the procedure outlined below.

Refer to Figure 2-1. Operate the stand to the reverse position and then remove the hand-throw lever M and shaft M2 and the segmental gear N. Next remove the lock bar guide plate P4, lift the lock bar P to disengage stud P2 from rack R, and withdraw the lock bar to permit the removal of the rack. With the rack removed, raise the escapement crank E and its shaft free of the operating crank G and rotate the escapement crank through 180 degrees. Then lower the escapement crank assembly so that the square portion of the shaft engages the operating crank, the relationship of the crank parts then being as shown in Figure 3-1(d). Replace rack R turned end-for-end with respect to its original position, making certain that roller Rl engages properly with the operating face of the escapement crank. With rocker arm K raised and latched to be clear of dog Pl (Figure 2-3(d), insert the lock bar P so that stud P2 engages the rack, and replace the lock bar guide plate P4. Reassemble the hand-throw lever M and gear N on the opposite side of the stand, being certain that the lug Nl on gear N projects away from the lock bar for Figure 1-7 assemblies and over the lock bar for Figure 1-8 assemblies. Proper engagement of the gear N with rack R is obtained by placing the "X" marks on the gear and rack in alignment.

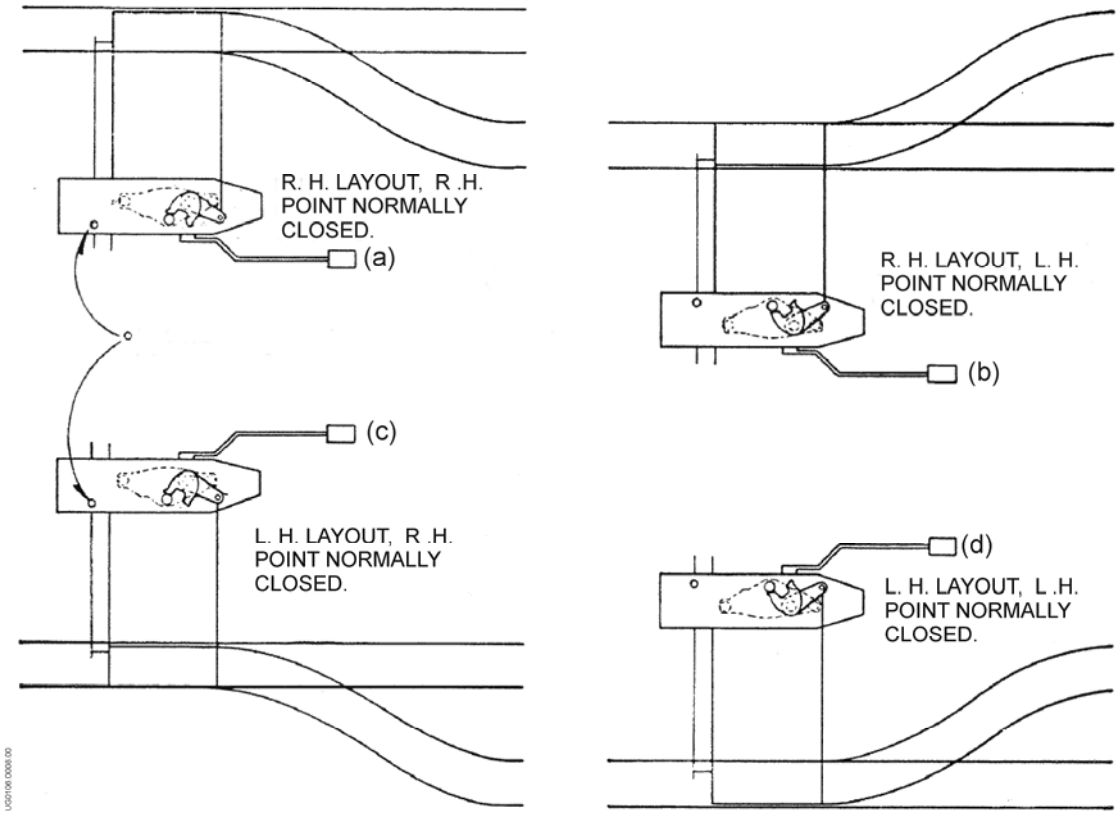


Figure 3-1. Switch Layout Diagrams

With the point detector bar removed, change the location of the point detector roller F3 (also the reverse point detector stud T, if used) to the opposite side of its lever (see also Figure 3-2), and interchange point detector bar bushings Vl and V2.

The relative positions of all parts should now agree with those shown in Figure 3-1(d).

The general arrangement of the operating mechanism for the various layouts is shown by Figure 3-1, and a procedure similar to that just described is followed in converting the mechanism from one arrangement to another.

The T-21 mechanism may be rearranged for right or left hand application in the same manner as the T-20 mechanism with the additional requirement that, when the rack has been turned end-for-end, the target drive crank must be turned 54 degrees (six serrations) to a position 27 degrees (three serrations) on the opposite side of the centerline of the movement in order to line up with the groove in the rack. The hub of the target drive crank and the bottom of the target shaft are marked, Figure 2-7(b), so as to indicate their relative positions in each instance.

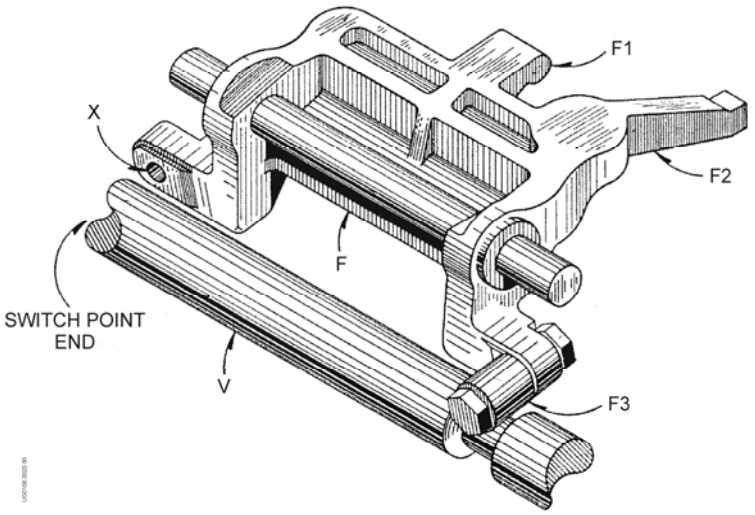


Figure 3-2. Point Detector Relationships

When it becomes necessary to alter the circuit controller contact combination, each pair of Reverse Point Detector contacts may be converted from Assembly T to Assembly U, and each pair of Normal contacts from Assembly W to Assembly V (Figure 3-3), or vice versa, observing precautions for contact adjustment given in Section 4.2.

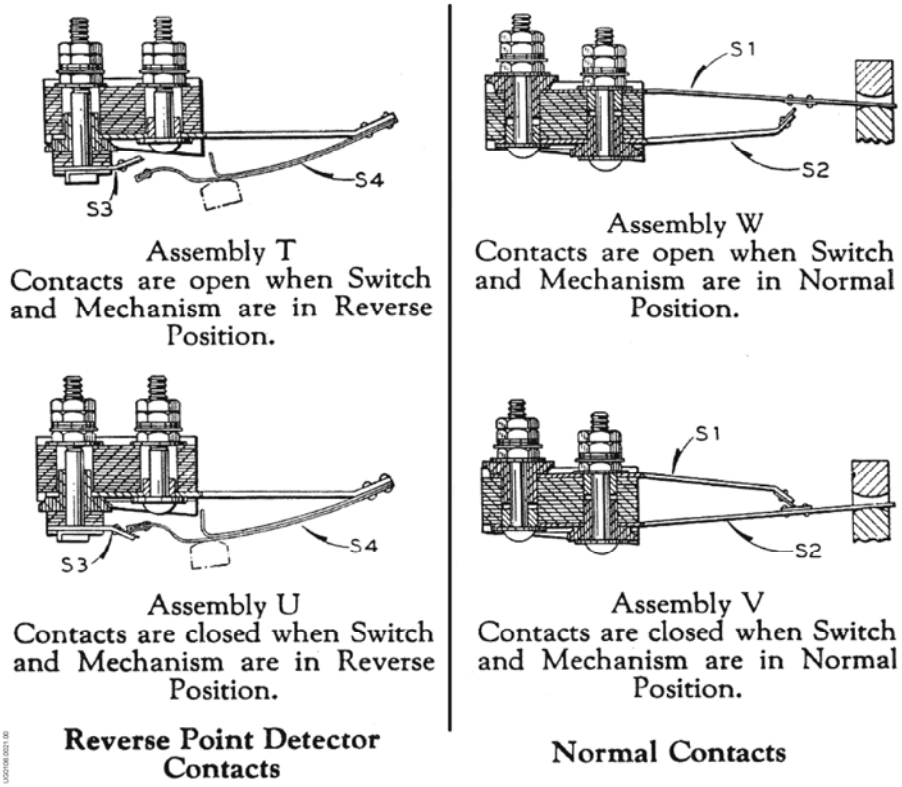


Figure 3-3. Contact Assemblies

3.2. Adjustments

3.2.1. Lock Rod and Point Detector

a. The lock rod and point detector connections should be adjusted so that the lock bar (plunger) will enter the lock rod notch, and the circuit controller will indicate, only when the switch point is within a certain distance of the stock rail as specified by the A.A.R. Signal Section or Railroad instructions.

b. To prevent unnecessary interference with signal indications by operation of the point detector latch during passage of traffic, it is suggested that the lock rod connection be adjusted to foul at less point opening than that at which the point detector is set.

c. Adjust the point detector connections first, before clamping the lock rod nuts, so that the lock rod notch can be aligned to permit the plunger (lock bar) to reach its Normal position and operate the circuit controller.

Switch stands having standard circuit controller without reverse point detector feature are fitted with a solid point detector bar which is adjusted by the nuts clamping the eye end of the point detector connecting rod.

Switch stands equipped with reverse point detector feature are fitted with sleeve type point detector bar per Figure 3-4 which requires adjustment in two places and in a certain sequence. First adjust the nuts X to check closure of far switch point. Then adjust the sleeve to check closure of near switch point.

NOTE

After all adjustments have been completed, check that the lock rod will foul the plunger when the switch point is obstructed to the degree required in checking the point detector. It will be necessary, therefore, to back off the lock rod nuts in subsequent checking of the point detector. (To assist in maintaining point detector adjustment during intervals between obstruction tests, gages are available to check the adjustment without disturbing point detector and lock rod connections. See Service Manual 5453).

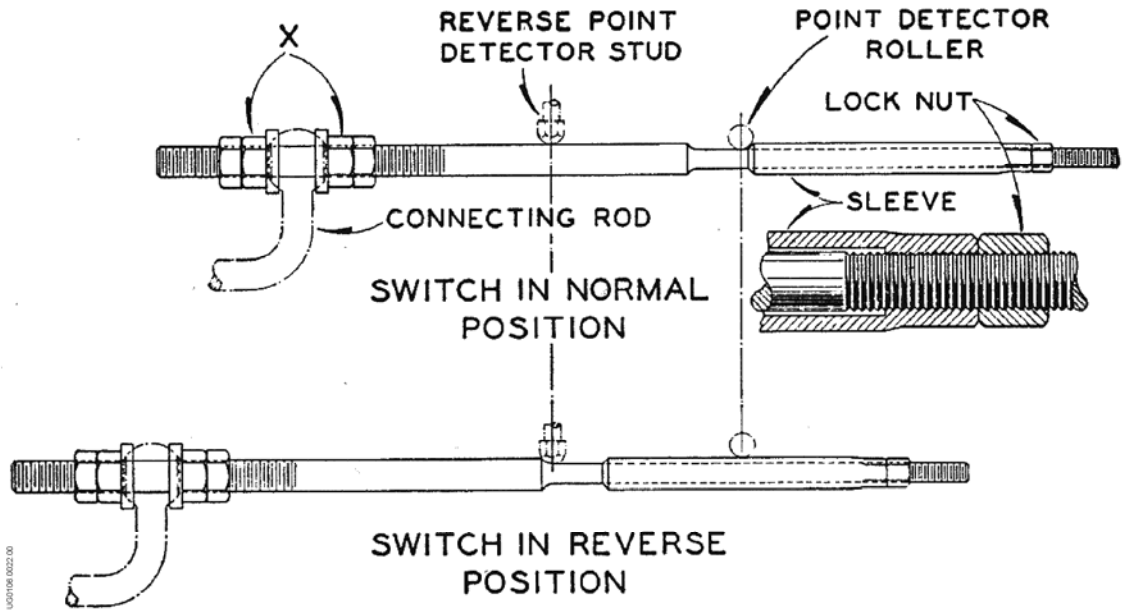


Figure 3-4. Sleeve Type Point Detector Bar

d. Referring to Figure 1-10 "A", the *minimum* distances of the switch point from the stock rail for which it is generally practicable to adjust the point detector and lock rod connections are 3/16" to 1/4" for the point detector and 1/8" to 3/16" for the lock rod. When the connections are adjusted to these *minimum* dimensions, the Normal circuit controller contacts should assume their Normal indication positions and the Reverse point detector contacts assume their Reverse indication positions when their respective switch points are closed on a 3/16" diameter rod located against the head of the stock rail 6" from the end of switch point, but should not assume these positions when the obstruction is a 1/4" diameter rod; the hand throw lever being operated full-stroke in each case. See Note under "C". Similarly, when the obstruction is 1/8", the locking stroke should be completed; but when the obstruction is 3/16", the lock rod should foul the lock bar (plunger) so as to prevent locking.

NOTE

The point detector latch should operate when the point detector connection is moved approximately 1/16" beyond the position at which the Normal indication is interrupted. If the contacts should be held by operation of the latch, release the latch by lifting arm J (Figure 2-3) or by operating the hand-throw lever to Reverse position and back again to Normal position.

3.2.2. Target

To align the target on the T-21 switch stand to suit curves or other layout conditions, remove the three mounting bolts which fasten the target bearing plate to the mechanism and lift the target assembly off. Remove the crank clamp bolt W2, slip the crank off the toothed end of the shaft, replace it at the desired new position and reassemble the bolt. The serrations inside of the crank collar will permit rotational adjustment in 9-degree steps.

3.2.3. Switch Stands with Independent Lock Bar

a. In such switch stands the lock bar is operated from another switch stand or lever stand by pipeline connection. As discussed in Section 1.3 and shown in Figure 1-8, gear N in such mechanisms is assembled with lug Nl over the lock bar PL to lock the hand-throw lever by means of dog P3 when the lock bar is operated to its locked-up position. Independent lock bar PL differs from stud-driven lock bar P not only in the absence of drive-stud P2 and in the addition of hand-throw locking dog P3 but also in the shape of dog Pl and the length of bar projecting beyond this dog. Referring to Figure 1-10 it will be seen that the shorter dog Pl permits 2" variation in the locked-up position of the remotely operated lock bar, between the inmost position (a) and the position (b) in which the circuit controller is just released (or about to be operated).

b. The driving connection must be adjusted to position the lock bar in its locked-up position between (a) and (b). So that the full 2" stroke between (a) and (b) may be available as leeway in this adjustment, the stroke delivered by the pipe-line connection must be not less than 5" to insure that the bar adjusted at (a) when locked-up will be pulled to or beyond position (c) when unlocked, and must be not more than 6-1/4" to insure that the bar adjusted at (b) when locked-up will not strike at position (d) when unlocked. When the stroke applied to the pipe-line connection is not between 5" and 6-1/4" (the stroke of the T-20 bar per "X" in Figure 1-5 and Figure 1-7 is 7 "), select ratios for the pipeline cranks which will deliver the 5" to 6-1/4" desired stroke. When the pipe-line is not compensated for thermal expansion, the connection adjustment should be made with due regard to the temperature at the time, placing the bar nearer position (a) in hot weather, and nearer position (b) in cold weather.

When adjusting the point detector and lock rod connections of such a stand, it must be remembered that the hand throw lever cannot be operated unless the lock bar is in the Reverse position and that the point detector operation of the Normal contacts cannot be observed unless the lock bar is in Normal position.

4. MAINTENANCE

4.1. Mechanism

The adjustments covered in Section 3.2 should be maintained at all times. The controller and latching device upon leaving the factory will have been properly adjusted and should need no further adjustment at the time of installation. After installation, however, the adjustments should be checked at intervals to insure that they are maintained in accordance with the information in this section.

NOTE

All adjustments and lubrication should be performed annually or in accordance with railroad maintenance schedules.

4.2. Circuit Controller Adjustment (Standard)

When assembled new, or if contacts are inverted in the field (to interchange open and closed positions), the contact spring board assemblies should be adjusted before mounting in the mechanism so that contacts per Assembly "W" (Figure 3-3) are closed, and contacts per Assembly "V" are open about 1/16" when the contacts are free of all restraint. Adjust by use of a spring bending tool applied to the long contact finger Sl near the terminal board.

With the switch stand fully assembled and in normal position, back off the conical headed screw K2 (Figure 2-3) until it is clear of the point detector lever knob Fl.

1. Adjust the nuts D2 (Figure 2-1) to obtain:

   a. 3/32" to 1/8" gap between fully open contacts,

   b. 2 lbs. to 3 lbs. pressure between fully closed contacts, and

   c. 1/32" to 1/8" clearance between the rocker arm K and the top of the lock bar P when the mechanism is in the normal position. If the contact gaps and pressures just specified cannot be obtained by adjustment of the nuts D2 within the range permitted by rocker arm clearance limits, then correct the gaps or pressures of individual contacts by bending the shorter contact fingers S2. Use a spring bending tool applied close to the terminal board.

2. After this has been done, remove the contact operating insulations D and, if necessary, bend the longer contact fingers Sl so that the contacts which stand open with the complete mechanism in its normal position are closed with approximately 1/2 lb. pressure, and the contacts which stand *closed* with the complete mechanism in its normal position are open approximately 1/16".

3. If it has been necessary to bend the springs as described in step 2, recheck the adjustment given in 2.

NOTE

When contacts per Assembly "W" are used in combination with contacts per Assembly "V" (Figure 3-3), adjust them so that one group opens 3/64" to 1/16" before the other closes as the switch mechanism is operated.

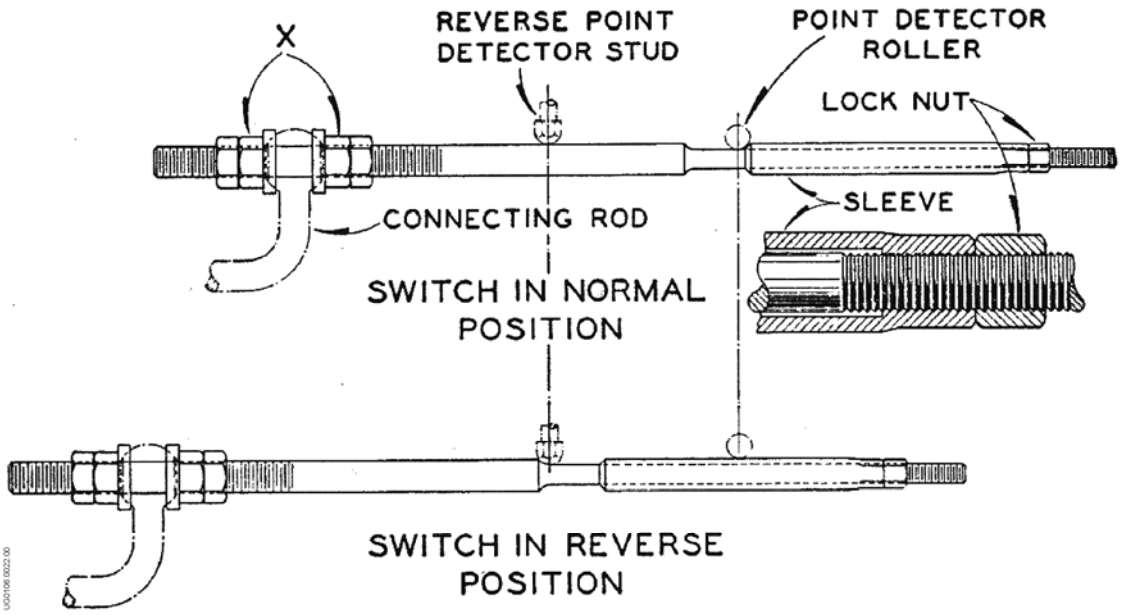


Figure 4-1. Sleeve Type Point Detector Bar

With the switch stand in normal position and the roller on the point detector lever F engaging the bottom of the groove in the point detector bar V, adjust the conical headed screw K2 until it just touches the finger Fl on the point detector lever. Back off screw K2 one-half turn and lock in place.

4.2.1. Point Detector Latch

See Figure 2-3. The point detector latch screw Jl should be adjusted so that 7/32" to 1/4" motion of the point detector bar V, measured from the position in which the rise in the groove is just touching the roller F3 with all lost motion taken up, causes the contacts to become latched in the closed (or open) position. To obtain this proceed as follows: With the mechanism and lock bar in normal position, adjust the latch screw Jl so that there is a vertical clearance of 1/8 in. min. 5/32 in. max. between the horizontal latching faces of latch screw J1 and finger F2 when the roller F3 is riding on the large diameter of the point detector bar V. See Figure 2-3 (F) . With the mechanism latched and the point detector bar back in its original position with the groove under

the roller, normally open contacts should be latched closed and have a contact pressure of at least 1 lb., and normally closed contacts should be latched open and have a gap of at least 1/16".

Latch screw J1 should be locked with the working face of the screw parallel to the corresponding face on the latch finger F2 of the point detector lever F.

4.2.2. Reverse Point Detector (when used)

See Figure 2-1. Adjust screw stud T so that 5/32" to 7/32" motion of the point detector bar, measured from the position in which the rise from small diameter to large diameter of the bar is just touching the head of the stud, will open or close the contacts (depending on the contact assembly —See Figure 3-3). Full contact opening should be 3/32" to 1/8", and pressure when fully closed should be 2 lbs. to 2-1/2 lbs.

4.3. Circuit Controller Adjustment (Heavy Duty)

Withdraw the lock bar L so as to place the top surface of dog K beneath roller M, Figure 2-4(c), by operating the hand-throw lever in mechanisms having the lock bar attached to the rack, or by operating the remote control for independent drive type lock bars. Stop lugs A1 on contact arm A should bear against the lugs on the frame. Under these conditions spring sockets H should just seat on the bosses of latch bracket B, as can be determined by observing rigidity of spring bolts. If necessary, adjust nuts P to obtain this seating without undue strain.

Under the conditions just described in the preceding paragraph , swing the upper end of latch D Figure 2-4(c) toward the contacts and observe that it returns freely beneath the head of adjusting screw G. This is necessary to assure that the latch will reset after being tripped. Nominal clearance of 1/16", as shown in Figure 2-4(c), is provided in manufacture. If wear of parts in service should reduce this clearance until the latch does not return freely beneath the screw head, clearance may be restored by filing the latch step.

CAUTION

It is essential that the head of adjusting screw G bear only on the outer corner of the latch step. Use a half-round or a three-cornered file to insure that inner corner of the latch step is kept clear. If the filing is done carelessly on the outer corner only, the latch may work out to tripping position under traffic vibration.)

Having checked the adjustments described in the preceding paragraphs, return the mechanism to Normal position, see Figure 2-4(a). With the groove in point detector bar V lined up with roller D1 on latch D, the roller D1 should just touch but not bind on the small diameter of the bar. (Note that the roller is urged toward the bar by action of spring E, while its travel is limited by engagement of the upper end of the latch against the end of screw G). If necessary, adjust screw G to obtain this condition and retighten lock nut G1.

Next, shift the point detector bar until the large diameter is opposite the roller and observe that the latch is thereby pulled out from under the head of screw G to allow free clearance for contact arm to drop down. The dimensions shown for this clearance on Figure 2-4(e) are nominal values for a new mechanism. Should wear of parts in service eventually result in doubtful clearance, the clearance may be increased by filing the vertical edge of the latch step.

With the mechanism in Normal position illustrated in Figure 2-4(a), withdraw the lock bar until the roller M is on the first part of dog K as shown in Figure 2-4(b). The contacts should be closed although they will not be engaged to their full-stroke position. Failure to obtain this condition indicates wear in pins or rollers requiring replacement.

The long arm projecting to the right from latch bracket B prevents opening of the contacts when the lock bar is withdrawn so that the dog K has moved out from under roller M towards the Reverse position indicated in dashed lines at right side of Figure 2-4(c). Check this protection by lifting the contact arm A until motion is stopped by engagement of the arm extension with the dog. In new controllers, the arm will provide this protection when it clears the lock bar by a nominal 1/32" to 1/16" with mechanism in Normal position as shown in Figure 2-4(a). If necessary, the arm extension may be bent to obtain the protection for Reverse position without binding in Normal position, placing a block between the arm near roller M and the lock bar to insure that roller M is not subjected to the blows.

4.4. Lubrication

4.4.1. T-20 &T-21 Switch Stands

When sent out from the factory, all working parts of the mechanism and circuit controller are sufficiently lubricated to be placed in service.

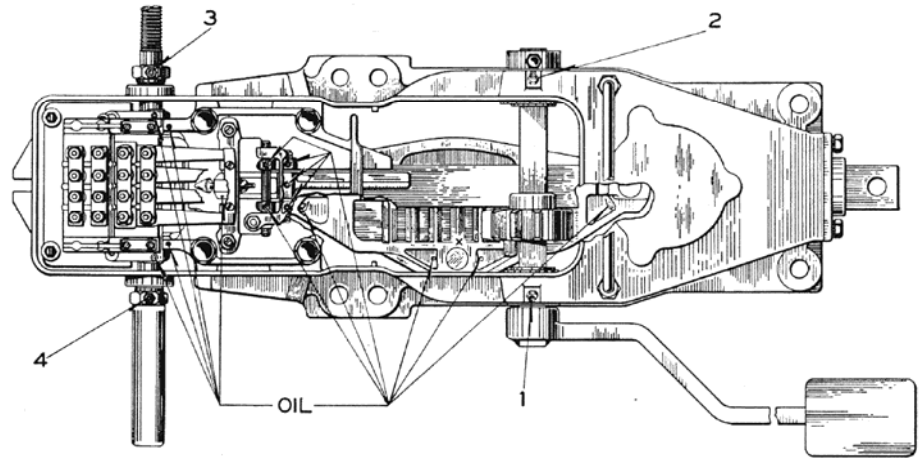
Lubricant for use in the crank bearings, lever shaft bearings, detector rod bearings, and the target shaft bearing (T-21 stand), should be pressure gun grease, high-quality bearing grease. Suitable lubricating fittings (see Figure 4-2) are provided to permit of applying the lubricant with a gun. This same lubricant is satisfactory for the gear and rack teeth, lock bar, contact operating dog, the underside of the rocker arm, and wearing surfaces of the operating crank.

Oil pockets and holes are provided for lubricating the rollers on the underside of the rack (see Figure 2-2). A good grade of medium-heavy engine oil should be used to lubricate these rollers and all pin bearings of the circuit controller (see Figure 4-2). Grease or dirt should not be allowed to accumulate in or around the oil pockets in the rack, since proper lubrication of the rack rollers depends on the oil flowing through the holes from the pockets.

4.4.2. Heavy Duty Circuit Controller

Lubricant for use in the grease fitting (Figure 5-3, Item 30) in latch bracket (Figure 5-3, Item 4) should be Texaco Novatex EP-1 or Alemite No. 32.

The knives of contacts (Figure 5-3, Item 11) should be coated with a light film of Petrolatum Grease.



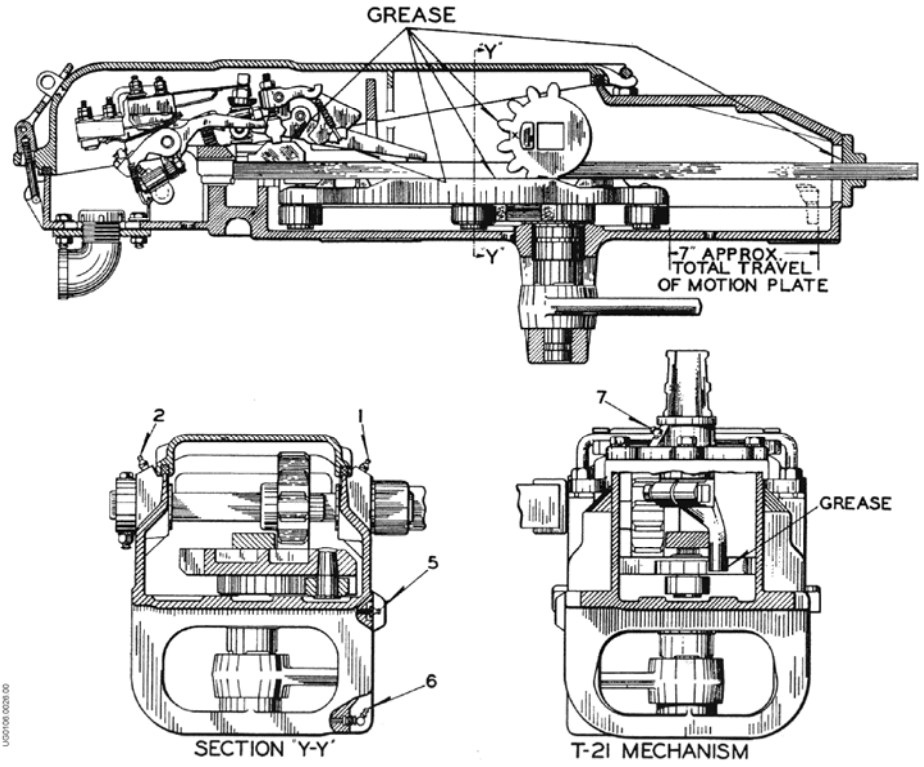


Figure 4-2. Lubrication Diagram

5. PARTS LIST

5.1. T-20 & T-21 SWITCH STANDS

Refer to Table 5-1 and Table 5-2 for the T-20 and T-21 Switch Stands part numbers and Figure 5-1 for the part locations.

Table 5-1. T-20 and T-21 Switch Stand Main Part Numbers

PART NO.	CONTROL CONTACTS	SWITCH LAYOUT	SW. PT. CLOSED	REF.
N103896	H. D.	R. H.	R. H.	A
N212768	4 Open	L. H.	L. H.	B
N212769	4 Open	L. H.	L. H.	C
N212788	4 Open	R. H.	R. H.	D
N385635	2 Op/2 Cl	R. H.	R. H.	E
N385635-0002	2 Op/2 Cl	L. H.	L. H.	F
N385636	4 Open	R. H.	R. H.	G
N385636-0002	4 Open	L. H.	L. H.	H
N385637	2 Op/2 Cl	R. H.	R. H.	I
N385637-0002	2 Op/2 Cl	L. H.	L. H.	J
N438907	2 Op/2 Cl	R. H.	R. H.	K
N438907-0001	2 Op/2 Cl	L. H.	L. H.	L
N438907-0002	2 Op/2 Cl	R. H.	L. H.	M
N438907-0003	2 Op/2 Cl	L. H.	R. H.	N

Table 5-2. T-20 and T-21 Switch Stand Component Part numbers

ITEM NO.	DESCRIPTION	PART NUMBER	USED ON
1	Box, Movement	M250855	All
2 (includes items 3 & 4)	Cover, Complete	N106162	All
3	Cover	M101405	All
4	Staple	M106161	All
5	Rack, Complete Includes the following:	N103462	All
	Rack	M101402	All
	Stud	M103341	All
	Roller	M210140	All
	Roller	M210139	All
	Stud	M103342	All

ITEM NO.	DESCRIPTION	PART NUMBER	USED ON
6	Crank, Escapement	M103456	All
7	Gear Pinion	M101401	All
8	Lock Bar Guide	M101444	All
9	Circuit Controller	N103551	B,C,D,G,H
9	Circuit Controller	N103854	A
9	Circuit Controller	N106778	E,F
9	Circuit Controller	N213496	I,J
9	Circuit Controller	N213496-001	K,L,M,N
10	Bar, Point Det.	N107199	A,B,C,D, E,F,G,H
11	Bar, Adj. Point Det.	N105110	I,J,K,L,M,N
12	Operating Lever	M103457	All
13	Journal Bearing	M194803	All
14	Bearing	M103446	All
15	Lever, Hand Throw, Complete includes the following:	N105792	All
	Lever Arm	R103543	All
	Shaft	M210138	All
	Counterweight	M435597	All
16	Lock Bar, Rack Driven	N103960	A
16	Lock Bar, Rack Driven	N103445	B,E,F,G,H, I,J,K,L,M,N
16	Lock Bar, Loose	N105169	C,D
17	Hasp, Complete includes the following:	N102112	All
	Hasp	M101442	All
	Nut	M101443	All
	Pin, Roll	J487301	All
18	Tee Bolt	M103344	All
19	Bolt, Cover Hold Down	M103381	All
20	Stud	M210569	A
20	Bolt	J046149	All except A
21	Screw, 1/2-13 x 1-1/4, Hex.	J050090	A,C,D
21	Screw, 1/2-13 x 1-1/8, Hex.	J050089	B,E,F,G,H,I,J,K,L, M,N

ITEM NO.	DESCRIPTION	PART NUMBER	USED ON
22	Bolt, 3/8-16 x 3-1/4	J046642	All
23	Nut, 1/2-13, Heavy	J048013	All
24	Nut, 5/8-11, Hex.	J048020	A
25	Washer, 3/8, Stl., Lk.	J047768	All
26	Washer, 1/2, Stl., Lk.	J047769	All
27	Washer, 5/8	J047771	All
28	Nut, 3/8	J048009	All
29	Clamp Washer	M250916	A
29	Clamp Washer	M188796	B,C,D
30	Bolt	M250913	A
30	Bolt	M189429	B,C,D
31	Nut	J480287	A,B,C,D
32	Grease Fitting, 1/8, St.	J039137	All
33	Terminal Board, Molded	J776059	A,B,C,D
34	Bracket, Contact (L.H.)	N251718	A
34	Bracket, Contact (L.H.)	M250835	B,C,D
35	Bracket, Contact (R.H.)	N251720	A
35	Bracket, Contact (R.H.)	M250836	B,C,D
36	Nut, Insulated, Molded	J048301	A,B,C,D
37	Grease Fitting, 1/8, Elbow	J039142	All
38	Screw, 5/16-18 x 1-5/8, Fil. Hd.	J052362	All
39	Packing	A067043	All
40	Bushing	M107488	All
41	Washer	M057102	A
42	Cover, Point Det.	M107486	A,B,C,D, E,F,G,H
42	Cover, Point Det.	M107487	I,J,K,L,M,N
43	Nut, 1/2-13, Sq.	J048240	All
44	Plug, 1/8 Sq. Hd.	J032900	All

ITEM NO.	DESCRIPTION	PART NUMBER	USED ON
45	Washer, 5/16, Lock	J047767	A,E,F,G,H,I,J,K,L, M,N
45	Washer, 5/16, Lock	J047526	B,C,D,
46	Filler	M232151	All
47	Washer, 1/2 Stl. Pl.	J047503	All
48	Plug	J032989	All
49	Protector, 1-3/16	J703330	All
50	Washer, 1/2, PH. BR. Lk.	J047751	A,B,C,D
51	Protector	J032926	All
52	Cover	M211381	All
53	Bolt	J046449	All
54	Screw	M065018	B,C,D
55	Cover Plate	M212022	B,C,D
56	Nut, 5/16-18	J048006	B,C,D
57	Washer, 5/16, Stl. Pl	J047642	B,C,D
58	Spring, Retainer	M109442	I,J,K,L,M,N
59	Latch Spring	M103557	I,J,K,L,M,N
60	Plug, 1-1/4	J032910	All
61	Terminal Block Assembly	N451161-4802	
62	Screw, # 8-32 x 3/4 lg.	J525107	Used with optional heater
63	Resistor, 800 Ω, 300 W	J720074	Used with optional heater
64	Screw, 14-24 x 1/2	J051340	B,C,D
65	Washer, 17/64 x 9/16	J047818	B,C,D
66	Washer, # 8 lk	J047714	Used with optional heater
67	Screw, # 8-32 x 3/8 lg.	J052530	Used with optional heater
68	Bracket, Switch Mounting	M451161-4701	Used with optional heater
69	Switch	J724515	Used with optional heater
70	Nameplate	M451607-7101	Used with optional heater

ITEM NO.	DESCRIPTION	PART NUMBER	USED ON
71	Washer,1/2, stl. pl.	J047503	All
72	Filler Block	M107206	All
73	Nut, 3/8 Hex, Stl. Plate	J048009	All
74	Bolt, 3/8 x 8, Sq. Stl.	J046653	All
75	Washer, 3/8, Stl. Plate	J047502	All
76	Wire - 12	A045017-0000	Used with optional heater
77	Terminal	J730044	Used with optional heater
78	Standard basic T-20 mechanism without circuit controller, point detector bar, and point detector bar cover. With rack driven lock bar and movement box.		
	Right hand layout Right hand switch point closed	N395795	Main view as shown in Figure 5-1.
	Right hand layout Left hand switch point closed	N395796	View X as shown in Figure 5-1.
	Left hand layout Left hand switch point closed	N395797	View Y as shown in Figure 5-1.
	Left hand layout Right hand switch point closed	N395798	View Z as shown in Figure 5-1.
79	Target Staff (High)	N383607	Optional
80	Target Staff (Low)	N383605	Optional
81	Traget Staff (Low)	N438380	Optional
82	Target Staff (Low)	N438381	Optional
83	Target Staff (Low) L. H. Point Closed	N49113801	Optional
84	Target Staff (Low) R. H. Point Closed	N49113802	Optional

ITEM NO.	DESCRIPTION	PART NUMBER	USED ON
85	Target Staff (Low Stub) L. H. Point Closed	X451846-4802	Optional
86	Target Staff (Low Stub) R. H. Point Closed	X451846-4803	Optional

NOTE D - POINT DETECTOR COVER & POINT DETECTOR BAR TO BE REMOVED & BE WIRED TO THE HAND THROW LEVER FOR SHIPMENT AFTER ASSEMBLY HAS BEEN COMPLETED AND CHECKED. CLOSE OPENINGS IN BASE WITH ITEMS 49 & 51.

NOTE E - HOOK END OF TENSION SPRING ITEM 59 TO BE CLOSED TO HOLD SPRING ATTACHED TO HOLE IN ANGLE.

NOTE H - MOUNT PINION ITEM 7, WITH ROUND HUB OVER LOCK BAR ITEM 16 WHEN LOCK BAR IS DRIVEN BY RACK. FOR LOOSE LOCK BAR ITEM 16, MOUNT PINION WITH LUG OVER LOCK BAR.

NOTE J - WHEN SWITCH LAYOUT DOES NOT REQUIRE A LOCK ROD, CLOSE OPENINGS IN BASE OF MECHANISM WITH MATERIAL PER ITEMS 72, 73, 47, 74, 75.

NOTE K - WHEN SWITCH LAYOUT DOES NOT REQUIRE A PT. DETECTOR ROD, CLOSE OPENINGS IN MECH. BOX WITH ITEM 60.

NOTE Y - CUSTOMER TO MODIFY HEIGHT OF SHAFT IN FIELD, DRILL FOR APPLICATION OF LAMP TIP (USING 1 - 1/4" O.D. ADAPTER) & TARGET WHEN REQUIRED.

NOTE Z - ENGINEERING DATA ON POSITION OF INDEPENDENT LOCK BAR PER DIAGRAM "X".

S - POSITION OF INNER END OF LOCK BAR AT INMOST NORMAL POSITION, WHEN DOG "F" STOPS AGAINST CIRCUIT CONTROLLER FRAME.

T - POSITION OF INNER END OF LOCK BAR AT OUTMOST NORMAL POSITION, WHEN DOG "F" WILL OPERATE CONTROLLER ROCKER ARM L.

U - POSITION OF INNER END OF LOCK BAR WHEN LOCK ROD IS JUST RELEASED & WHEN DOG "C" CLEARS LUG "H" ON GEAR SO THAT HAND THROW LEVER CAN BE THROWN 180°.

V - POSITION OF INNER END OF LOCK BAR AT FULLY WITHDRAWN POSITION, WHEN STOP SCREW "J" STRIKES COVER PLATE "K" & DOG "F" IS ABOUT TO BE WITHDRAWN FROM UNDER ROCKER ARM "L".

NOTE INDEPENDENT LOCK BAR IS DESIGNED FOR A WITHDRAWAL STROKE OF 5 TO 6-1/4 INCHES WHICH WILL PERMIT A 2 INCH VARIATION IN THE ADJUSTED POSITION OF LOCK BAR. A STROKE GREATER THAN 5-1/4 INCHES OR LESS THAN 5 INCHES WILL REDUCE THE 2 INCH PERMISSABLE VARIATION BY AN AMOUNT EQUAL TO THE INCREASE OR DECREASE IN WITHDRAWAL STROKE.

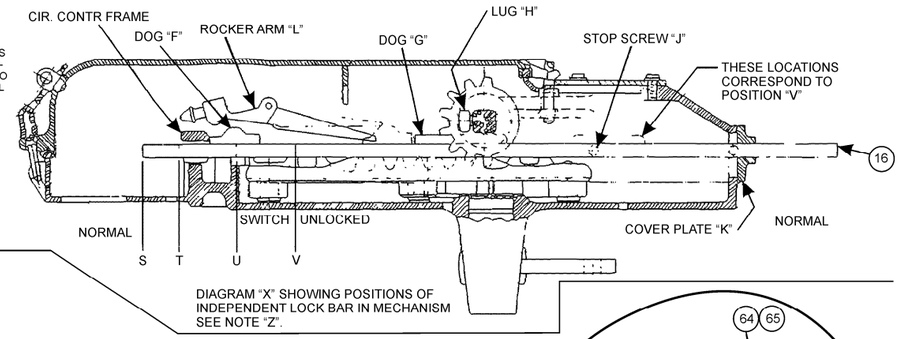
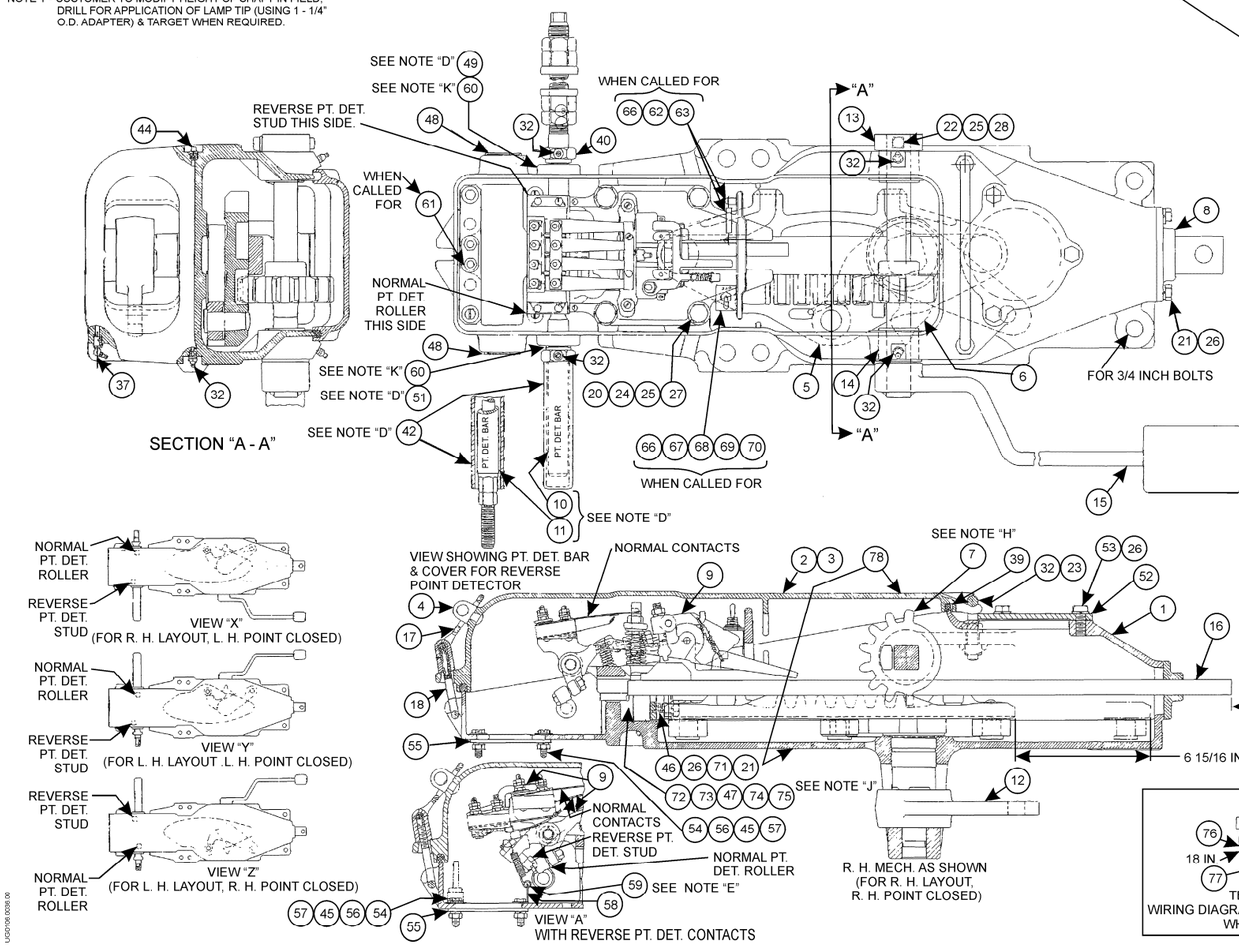
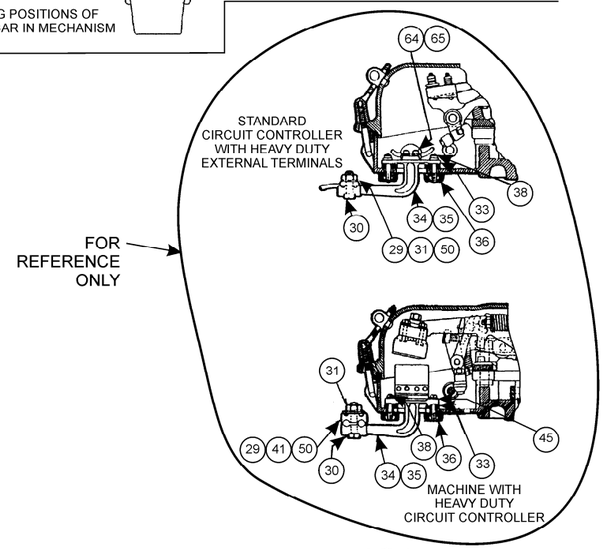


DIAGRAM "X" SHOWING POSITIONS OF INDEPENDENT LOCK BAR IN MECHANISM SEE NOTE "Z".





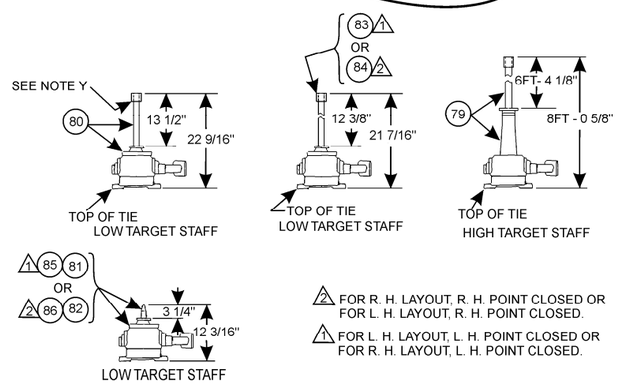


Figure 5-1. Switch Stand Assembly Parts Location

5.2. Circuit Controllers

Refer to Table 5-3 and Table 5-4 for the Circuit Controller part numbers and Figure 5-2 for the part locations.

Table 5-3. T-20 and T-21 Circuit Controller Main Part Numbers

PART NO.	CONTROL CONTACTS	REV. PT. DET.	REF.
N103551	4 Open	W/O	A
N106778	2 Open/2 Closed	W/O	B
N213496	2 Open/2 Closed	With	C
N213496001	2 Open/2 Closed	With	D

Table 5-4. Circuit Controller Component Part numbers

ITEM NO.	DESCRIPTION	PART NUMBER	USED ON
2	Frame, Complete	N103463001	D
2	Frame, Complete	N103463	A,B,C,D
3	Rocker Arm	M101438	A,B,C,D
4	Latch Arm	M101439	A,B,C,D
5	Point Detector Lever	M210925	A,B,C,D
6	Contact Operating Bracket	M101441	A,B,C,D
7	Contact Spring Board	N103420	A
7	Contact Spring Board	N105980	B,C,D
8	Contact Spring Board Rev. Pt. Det.	N213490	C,D
9	Adjusting Screw	M261362	A,B,C,D
9a	Nut, 1/2-20, Hex, Jam	J048181	A,B,C,D
9b	Washer, 1/2, Lock	J047783	A,B,C,D
10	Roller Screw	M103359	A,B,C,D
11	Roller	M210141	A,B,C,D
12	Point Det. Latch, Adj.	M293159	A,B,C,D
13	Cap, Springboard, Molded	J078053	A,B,C,D
14	Support, Contact, Molded	J077695	A,B,C,D
15	Pin	M049875	A,B,C,D
15a	Cotter, 1/8 x 3/4	J048618	A,B,C,D
16	Pin	M209386	A,B,C,D
16a	Cotter, 1/8 x 3/4	J048618	A,B,C,D
17	Pin	M209417	A,B,C,D

ITEM NO.	DESCRIPTION	PART NUMBER	USED ON
17a	Cotter, 1/8 x 1-1/4	J048622	A,B,C,D
18	Shaft	M105336	A,B
18a	Cotter, 1/8 x 7/8	J048619	A,B
19	Shaft	M105105	C,D
19a	Cotter, 3/32 x 7/8	J048612	C,D
20	Screw	M249659	A,B
20a	Washer, 3/16, Pl.	J047500	A,B
20b	Washer, Lk.	J047669	A,B
22	Spring, Pt. Det. Lever	M103348	A,B,C,D
23	Spring, Latch	M103557	A,B,C,D
24	Spring, Ph. Br.	J068792	A,B,C,D
25	Nut, 3/8-24	J048063	A,B,C,D
26	Nut, 5/16-18	J048006	A,B,C,D
27	Nut, 3/8, Elastic Stop	J048111	A,B,C,D
28	Washer, 5/16, Lk.	J047767	A,B,C,D
29	Washer, 3/8, Lk.	J047768	A,B,C,D
30	Screw, #12-28 x 1-1/8, Fil.	M451358-2518	A,B,C,D
31	Screw, #10-30 x 1/2, Fil.	M451358-0108	C,D
32	Washer, #10, Lk.	J047733	C,D
33	Bracket, Term. Bd. Mtg.	M210927	C,D
34	Stud, Pt. Det.	M105096	C,D
35	Nut, 1/2-20, Hex, Jam	J048181	C,D
36	Screw	M105288	C,D
36a	Washer, 3/16, Pl.	J047500	C,D
36b	Washer, Lk.	J047669	C,D
37	Lever, Rev. Pt. Det.	M210926	C,D
38	Contact Support	M105095	C,D
39	Board	J077026	A,B,C,D
40	Contact Spring	N072592	A,B,C,D
41	Contact Spring	N072590	A,B,C,D
42	Contact Spring	N105102	C,D
43	Contact, Fixed	N105098	C,D
44	Spacer, Contact	N105094	C,D
45	Bushing, Ins.	J077634	A,B,C,D
46	Terminal Post	N125782	A,B,C,D
47	Terminal Post	N125781	A,B,C,D
48	Terminal Post	N105175	C,D

ITEM NO.	DESCRIPTION	PART NUMBER	USED ON
49	Terminal Post	N130200	C,D
50	Terminal Connector (4-Way)	M047290	A,B,C,D
50a	Terminal Connector (2-Way)	M047290	A,B,C,D
51	Terminal Post Lock	M105177	C,D
52	Washer	M076515	A,B,C,D
53	Washer	J047818	A,B,C,D
54	Nut, Hex	J480300	A,B,C,D

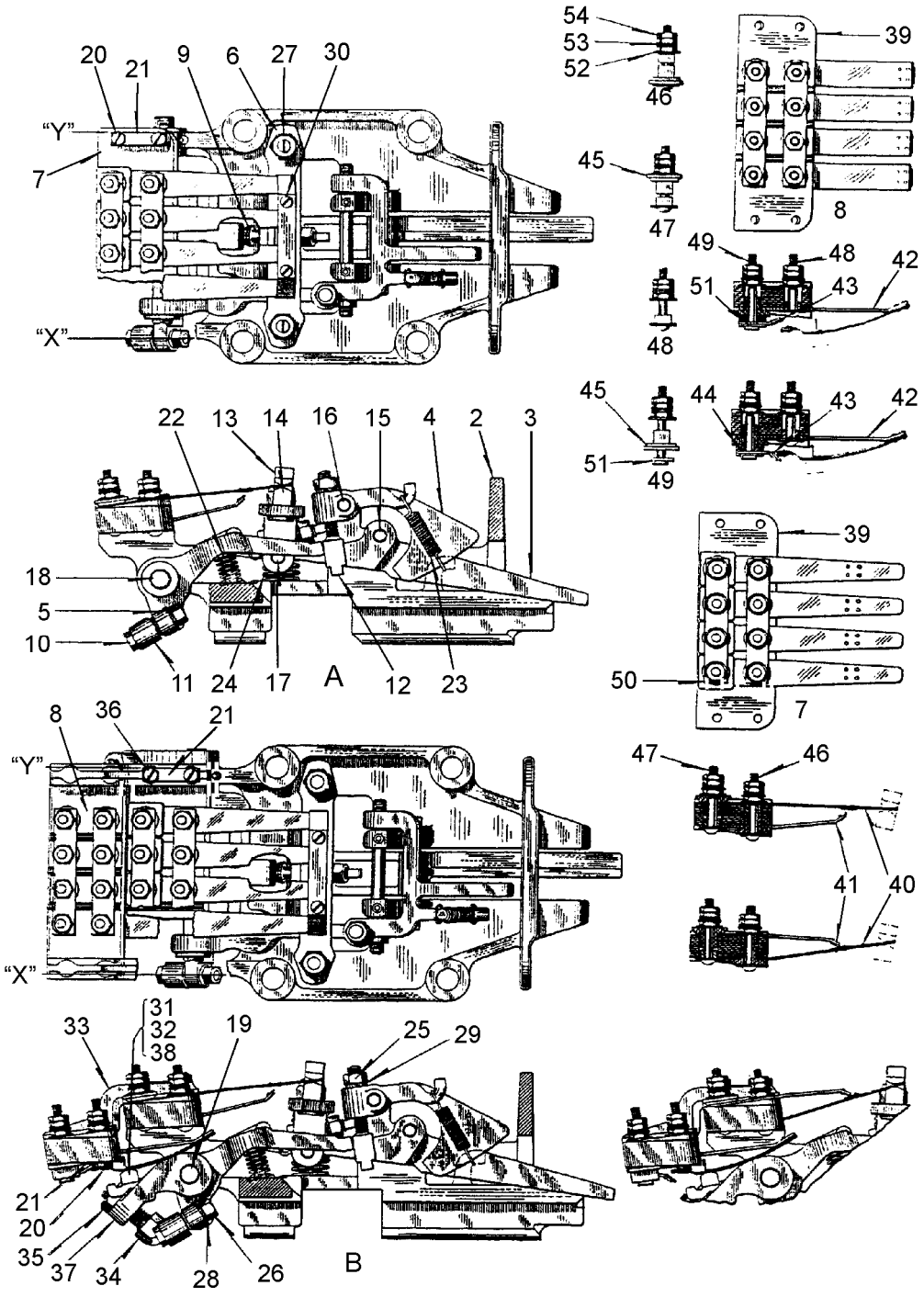


Figure 5-2. Circuit Controller Assembly

5.3. Heavy Duty Circuit Controller (for reference only)

Refer to Table 5-5 for the Heavy Circuit Controller part numbers and Figure 5-3 for the part locations.

Table 5-5. Heavy Duty Circuit Controller Part Numbers

ITEM NO.	DESCRIPTION	PART NUMBER
	Heavy Duty Circuit Controller, complete	N103854
2	Frame, Complete	M103851
3	Contact Arm	M103629
4	Latch bracket, Complete	N103628
5	Bushing, P/O Item 4	M207745
6	Roller, P/O Item 4	M210514
7	Roller, P/O Item 4	M189298
8	Pin, P/O Item 4	M189297
9	Pin, P/O Item 4	M189296
10	Latch	M103913
11	Contact	M160612
12	Pin	M210523
13	Shaft, Complete	N189427
14	Pin	M210522
15	Eye Bolt	M210721
16	Spring Socket	M189423
17	Point Detector Roller & Stud	N103832
18	Contact Block	M160556
19	Screw, Latch Adj.	M210245
20	Spring	J068665
21	Spring	J068667
22	Spring	M103843
23	Washer	M155385
24	Nut, 5/8-18 Hex, Jam	J048083
25	Screw, 3/8-16 x 1-3/4	J050059
25a	Nut, 3/8-16, Hex	J048009
25b	Washer, Lock, 3/8	J047768
26	Screw, 1/4-20 x 1-1/2, Hex	J050023
26a	Nut, 1/4-20, Hex	J048002
26b	Washer, 1/4, Lock	J047766

ITEM NO.	DESCRIPTION	PART NUMBER
26c	Washer, 1/4, Plate	J047501
27	Nut, 3/8, Elastic Stop	J048111
28	Cotter, 1/8 x 3/4	J048618
29	Cotter, 3/16 x 1-1/8	J048632
30	Fitting, Grease, 1/8" P.T.	J039137
31	Nut, 3/8-16	J048009
32	Washer, 3/8, Lock	J047768

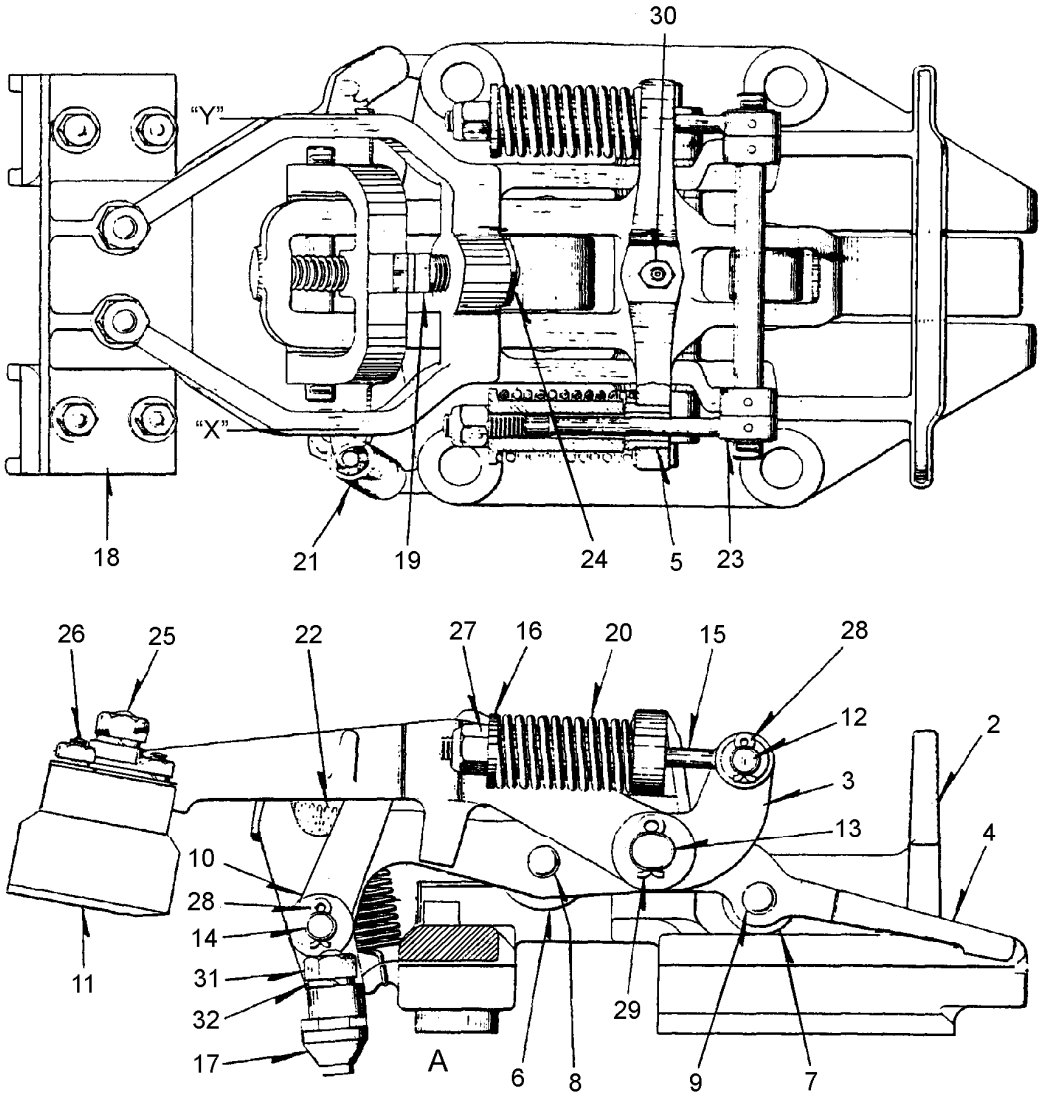


Figure 5-3. Heavy Duty Circuit Controller Assembly (for reference only)

6. RAIL TEAM AND TECHNICAL SUPPORT

The Rapid Action Information Link Team (RAIL Team) is a group of experienced product and application engineers ready to assist you to resolve any technical issues concerning this product. Contact the RAIL Team in the United States at 1-800-652-7276 or by e-mail at railteam@ansaldo-sts.us.

End of Manual